Blueprints

An Integrated Water Resources Plan for Lancaster County




The Water Resources Element

October 2012

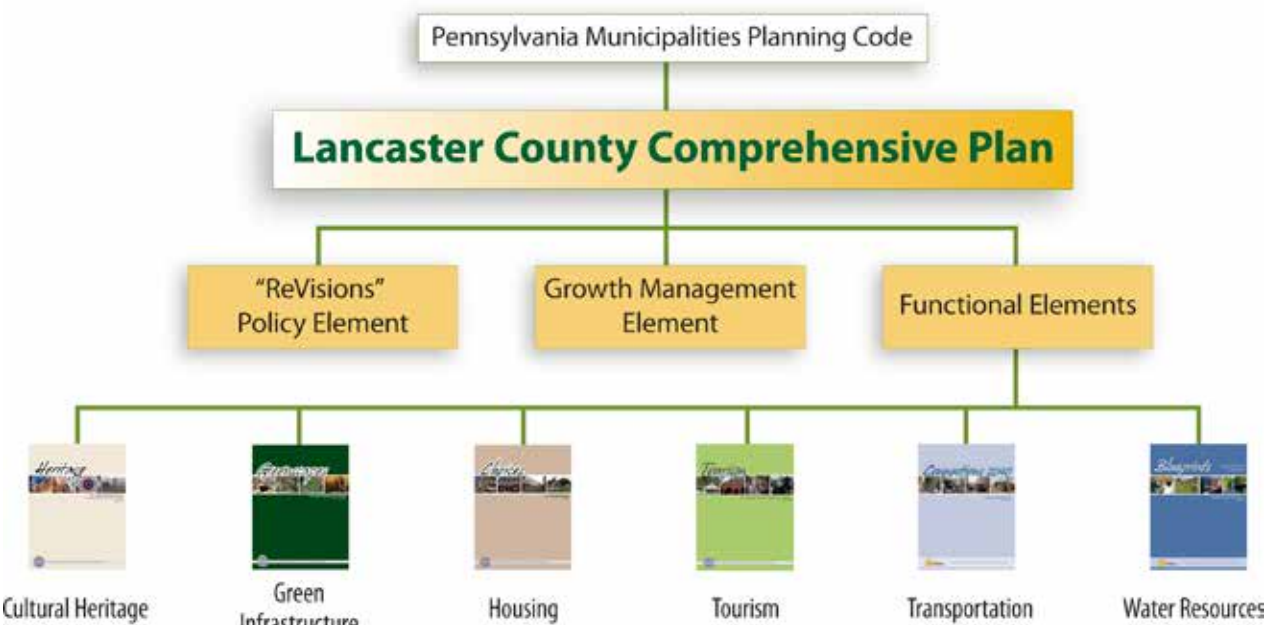
Countywide Act 167 Plan

April 2013

Amended October 2013

ENVISION LANCASTERCOUNTY

The Comprehensive Plan for Lancaster County, Pennsylvania


Pennsylvania Municipalities Planning Code
Lancaster County Comprehensive Plan
"ReVisions" Policy Element
Growth Management Element
Functional Elements
Cultural Heritage
Green Infrastructure
Housing
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Transportation
Water Resources

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RESOLUTION NO. 86 OF 2012

On motion of Commissioner Stuckey, seconded by Commissioner Lehman;

WHEREAS, The Board of County Commissioners charged the Lancaster County Planning Commission with developing and implementing the Comprehensive Plan for the County, known as *Envision Lancaster County*; and

WHEREAS, *Envision Lancaster County* currently consists of seven functional elements, including *Balance*, the Growth Management Element; and

WHEREAS, *Balance* calls for the preparation of a water resources plan as an additional element for *Envision Lancaster County*; and

WHEREAS, In accordance with the Pennsylvania Stormwater Management Act, Act 167 of 1978, the County is required to prepare and adopt a Countywide Act 167 Stormwater Management Plan; and

WHEREAS, The Lancaster County Planning Commission staff, with the assistance of the Water Resources Plan Advisory Committee and substantial public involvement throughout the planning process, has prepared a water resources element for *Envision Lancaster County*; and

WHEREAS, The new element, titled *Blueprints: An Integrated Water Resources Plan for Lancaster County (Act 247 and 167)*, promotes watershed-based integrated water resources planning and management to protect, conserve, and improve water resources in Lancaster County; and

WHEREAS, *Blueprints*, including maps, charts, textual matter and other materials, will also serve as the official Countywide Stormwater Management Plan in accordance with the requirements of the Pennsylvania Stormwater Management Act, Act 167 of 1978; and

WHEREAS, *Blueprints* contains a Model Stormwater Management Ordinance as a tool to assist municipalities in meeting their obligations under Act 167 and to manage stormwater in a more integrated, cost effective, and ecologically sensitive manner consistent with the Act 167 stormwater management provisions in *Blueprints*; and

WHEREAS, The Lancaster County Planning Commission, at its regular meeting on September 10, 2012, recommended that the Lancaster County Board of Commissioners adopt *Blueprints* as an official functional element of *Envision Lancaster County* and to serve as the official Stormwater Management Plan of Lancaster County; and

WHEREAS, The Board of Commissioners, in compliance with the PA Municipalities Planning Code, held a duly advertised 45 day review and comment period on *Blueprints;* and

WHEREAS, A public hearing was held September 19, 2012, by the Lancaster County Board of Commissioners to receive input regarding *Blueprints*; and

WHEREAS, Following adoption by the Lancaster County Board of Commissioners, *Blueprints* will be submitted to the Pennsylvania Department of Environmental Protection for approval in accordance with the requirements of Act 167.

NOW, THEREFORE, BE IT RESOLVED BY THE LANCASTER COUNTY BOARD OF COMMISSIONERS, That the Board hereby adopts *Blueprints: An Integrated Water Resources Plan for Lancaster County (Act 247 and 167)* as an element of *Envision Lancaster County* and the official *Countywide Act 167 Stormwater Management Plan* for Lancaster County.

"continued"

Resolution No. 86 of 2012
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Motion passed unanimously.

ADOPTED this 10th day of October, 2012 by the Board of Commissioners of the County of Lancaster, Pennsylvania in lawful session duly assembled.

ATTEST:

Andrea McCue, Chief Clerk
County of Lancaster, PA
Date: October 10, 2012

Scott F. Martin, Chairman

Dennis P. Stuckey, Vice Chairman

Craig E. Lehman

Board of Commissioners of
Lancaster County, Pennsylvania

10/10/12

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
WATERWAYS & WETLANDS

RECEIVED
MAY 22 2013
LANCASTER COUNTY
PLANNING COMMISSION

MAY 21 2013

Mr. James Cowhey, AICP
Executive Director
Lancaster County Planning Commission
150 N. Queen Street, Suite 320
Lancaster, PA 17603

Re: Approval of the Lancaster County Countywide Act 167 Plan
Lancaster County, Pennsylvania

Dear Mr. Cowhey:

On May 1, 2013, the Lancaster County Commissioners adopted the Lancaster County Countywide Act 167 Stormwater Management Plan (SWM Plan), including an amendment to Article III of the Model Ordinance therein. The adopted SWM Plan was submitted to DEP for review and approval in accordance with Section 9 of the Pennsylvania Storm Water Management Act, 32 P.S. §§680.1 et seq. ("Act 167") and the Pennsylvania Clean Streams Law, 35 P.S. §§691.1 et seq. ("The Clean Streams Law") on May 3, 2013 and was received by the Pennsylvania Department of Environmental Protection (DEP) on May 6, 2013.

DEP and the Department of Community and Economic Development (DCED) have reviewed the SWM Plan and find the SWM Plan to be consistent with municipal floodplain management plans, state programs that regulate dams, encroachments and water obstructions, and state and federal flood control programs. The SWM Plan also is compatible with other watershed SWM Plan's in the vicinity of Lancaster County's watersheds and is consistent with the purpose and policy of the Storm Water Management Act.

DEP hereby approves the amended SWM Plan.

According to Section 11(b) of Act 167, municipalities subject to the SWM Plan must enact or amend and implement such ordinances as necessary to regulate development in a manner consistent with the SWM Plan by **November 21, 2013**. Municipalities are encouraged to use the model ordinance included with the SWM Plan. DEP will send notices to each municipality subject to this requirement.

As you may be aware, DEP and the Pennsylvania Infrastructure Investment Authority (PENNVEST) developed a program that funds the construction of non-point source Best Management Practices (BMPs). Under the program, municipalities may apply for funds to construct stormwater management projects that reduce stormwater impact. For more information, see www.pennvest.state.pa.us.

Southcentral Regional Office | 909 Elmerton Avenue | Harrisburg, PA 17110-8200
717.705.4702 | Fax 717.705.4830 Printed on Recycled Paper www.depweb.state.pa.us

James Cowhey - 2 - MAY 21 2013

Any person aggrieved by this decision may appeal pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. Section 7514, and the Administrative Agency Law, 2 Pa. C.S. Chapter 5A, to the Environmental Hearing Board, Second Floor, Rachel Carson State Office Building, 400 Market St., PO Box 8457, Harrisburg, PA 17105-8457, telephone number 717.787.3483. TDD users may contact the board through the Pennsylvania Relay Service at 1-800-654-5984. Appeals must be filed with the Environmental Hearing Board within 30 days of receipt of written notice of this decision, unless the appropriate statute provides a different time period. Copies of the appeal form and the Board's rules of practice and procedure may be obtained from the board. The appeal form and the Board's rules of practice and procedure are also available in Braille or on audiotape from the Secretary to the Board at 717-787-3483. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

Thank you for participating in the Stormwater Management Program. We hope that Lancaster County receives many benefits as a result of adopting the SWM Plan and its accompanying stormwater management ordinance. If you have any questions or need further assistance, please contact Ms. Jineen Boyle by e-mail at jiboyle@pa.gov or by telephone at 717.705.4916.

Sincerely,

Scott R. Williamson
Program Manager
Waterways & Wetlands Program

cc: Ron Furlan, DEP Division of Planning and Permits
Maria Bebenek, DEP SCRO Clean Water Program
Dan Fitzpatrick, PA Dept. of Community and Economic Development
Rebecca Buchanan, Lancaster County Conservation District

ACKNOWLEDGEMENTS

Prepared by
Countywide Planning Division, Lancaster County Planning Commission
Mary Gattis, AICP, *Senior Countywide Planner, Project Manager*

Lancaster County Board of Commissioners
Scott Martin, *Chairman*
Dennis P. Stuckey, *Vice-Chairman*
Craig Lehman

Water Resources Plan Advisory Committee
Dennis Groff, *Chair*
Charlotte Katzenmoyer, *Infrastructure Workgroup Lead*
Steven Sylvester, *Quality/Quantity/Source Workgroup Lead*
Ron Beam
Jay Braund
Luke Brubaker
Lamonte Garber
Steve Gault
Andy Gavin
Ralph Goodno
Terry Kauffman
Mark Johnson
Michael Kyle
Mike LaSala
David Lewis
Herb Mattern
Don McNutt
Nate Merkel
Bob Mohn
Leon Ressler
Jay Snyder
Charlie Souders
Heather Valudes

Lancaster County Planning Commission
Ray D'Agostino, *Chairperson*
Dennis Groff, *Vice-Chairperson*
Leo Lutz, *Secretary*
Kathy Wasong
David Kratzer, Jr.
Thomas McDermott
David Zimmerman
Matthew Young
James Reichenbach

Project Team
Lancaster County Planning Commission Staff
James Cowhey, AICP, *Executive Director*

Scott Standish, *Director for Countywide Planning*
Mary Gattis, AICP, *Senior Countywide Planner*
Michael Domin, AICP, *Principal Countywide Planner*
Mary Frey, AICP, *Principal Countywide Planner*
Donna Hahn, *Administrative Secretary*
Tara Hitchens, AICP, *Senior Community Planner*
Patrick McKinney, *Countywide Planner*
Gwen Newell, AICP, RLA, *Senior Community Planner*
Matthew Preheim, *Intern*
Marie Quigg, *Administrative Secretary*
Dean Severson, AICP, *Principal Agricultural and Rural Planning Analyst*
Brad Stewart, *Community Planner*

Workgroup Participants

Ron Beam
John Bingham
Steve Bonner
Bill Brown
Luke Brubaker
Rebecca Buchanan
Harry Campbell
Ralph Carruthers
Eric Conrad
Ed Corriveau
Matt Crème
John Dochter
Ben Ehrhart
Norma Enck
Justin Evans
Steve Fulton
Lamonte Garber
Kent Gardner
Andrew J. Gavin
Ralph Goodno
Bryan Grill
Mark Gutshall
Mark Hackenburg
Scott Hain
Randy Hess
Jeff Hill
Frank Howe
Chester Hughes
Rick Jackson
Brian Kane
Charlotte Katzenmoyer
Todd Kauffman
Terry Kauffman
Rick Keister
Carl Kline
Matt Kofroth
David W. Kratzer
Michael Kyle
Mike LaSala
John Leaman
Karen Martynick
Herbert E. Mattern
Mike McCaskey
Jeri McClune
David C. McCracken
Dee Dee McGuire
Don McNutt
Phil Mellott
Brad Michael
Jim Miller
Bob Mohn
Carl Neff
Morris Perot
Jack Phillips
Cory Rathman
Gregg Robertson
Jake Romig
Jay Snyder
Steven Sylvester, P.G.
Heather Valudes
Bob Walter
Andy Weaver
Karen Weibel
Peter Whipple
Greg Wilson
Elijah Yearick
Dave Zimmerman

Act 167 Plan Advisory Committee (PAC)

In accordance with the requirements of Act 167 of 1978, the Plan Advisory Committee included at least one representative from each municipality in the county, municipal solicitors, municipal engineers, the Lancaster County Conservation District, and other agencies and groups involved in stormwater management issues in the county.

The County wishes to acknowledge all members for their participation and assistance in developing the Act 167 provisions of *Blueprints,* including the Model Stormwater Management Ordinance.

ACRONYMS

BMP – Best Management Practice

CAFO – Concentrated Animal Feeding Operation

CARA – Critical Aquifer Recharge Area

CIP – Capital Improvement Plan

DGA – Designated Growth Area

EPA – U.S. Environmental Protection Agency

GIS – Geographic Information Systems

HUC – Hydrologic Unit Code

IWRM – Integrated Water Resources Management

IWRP – Integrated Water Resources Plan

LCCD – Lancaster County Conservation District

LCPC – Lancaster County Planning Commission

LIMC – Lancaster Inter-Municipal Committee

LID – Low Impact Development

LiDAR – Light Detection and Ranging

MPC – Pennsylvania Municipalities Planning Code (Act 247)

MPO – Metropolitan Planning Organization

MS4 – Municipal Separate Storm Sewer System

NGO – Non-Governmental Organization

NFWF – National Fish and Wildlife Foundation

NPDES – National Pollutant Discharge Elimination System

OLDS – On-Lot Disposal Systems

PADEP – Pennsylvania Department of Environmental Protection

PAC – Act 167 Plan Advisory Committee

SALDO – Subdivision and Land Development Ordinance

SRBC – Susquehanna River Basin Commission

SWPTAP – Source Water Protection Technical Assistance Program

SWM – Stormwater Management

TIP – Transportation Improvement Program

TMDL – Total Maximum Daily Load

TN – Total nitrogen

TP – Total phosphorus

UGA – Urban Growth Area

USGS – U.S. Geological Survey

VGA – Village Growth Area

WIP – Watershed Implementation Plan

DEFINITIONS

319 Plan. A Watershed Implementation Plan written in accordance with Section 319 of the Clean Water Act.

Act 167. Pennsylvania's Stormwater Management Act (1978), which requires stormwater management plans for all watersheds in the county.

Act 220. Pennsylvania's Water Resources Planning Act.

Act 247. The Pennsylvania Municipalities Planning Code.

Act 537. Pennsylvania's Sewage Facilities Act (1966), enacted to correct current and prevent future waste disposal problems. To meet the requirements municipalities must adopt sewage facilities plans for which they are then responsible to enforce.

Betterment. A project that treats/corrects an existing roadway to bring it up to current design standards. Treatments/corrections may involve drainage improvements.

Clean Water Act. The federal Act regarding pollution control in America's waterways. The CWA establishes standards for industrial and residential water quality management.

Legacy sediment. Sediment that was eroded from upland areas after the arrival of early Colonial settlers and during centuries of intensive land uses; that deposited in valley bottoms along stream corridors, burying pre-settlement streams, floodplains, wetlands, and valley bottoms; and that altered and continues to impair the hydrologic, biologic, aquatic, riparian, and water quality functions of pre-settlement and modern environments.

Needs area. An area identified in an Act 537 Plan as having failing on-lot sewage disposal systems.

Safe Drinking Water Act. The main federal law that ensures the quality and safety of America's drinking water supply. Through this Act the PADEP sets and oversees the standards for drinking water and ensures the protection of drinking water sources.

Source water. Untreated water from streams, rivers, lakes, springs or underground aquifers that is used to provide public drinking water, as well to supply private wells used for human consumption.

Tree canopy. The layer of leaves, branches, and stems of trees that cover the ground when viewed from above.

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CHAPTER 1
Introduction

Purpose of *Blueprints*

Blueprints, the Water Resources Element of the Lancaster County Comprehensive Plan (Act 247 and 167), promotes watershed-based integrated water resources planning and management to protect, conserve and improve water resources in Lancaster County. It advances the concepts of integrated water resources planning (IWRP) and integrated water resources management (IWRM) by emphasizing the relationships among water resource issues and programs, such as stormwater management and drinking water supply or source water protection and manure management, and recommending strategies to address these issues more effectively.

Blueprints encourages those involved in water resources planning and management to adopt a "systems thinking" approach. Systems thinking is a management approach which requires recognition of the inter-relatedness of the individual parts that make up a particular system. When applied to water resources management, systems thinking can help identify the most effective management strategies within the context of the entire hydrologic system.

Planning for and managing water resources has become a tremendous challenge, leaving many paralyzed by the ever increasing complexity of regulations and the simultaneous decline in resources. Our streams are literally collapsing under the burden of the stormwater they're relied on to transport. Meanwhile, studies have shown that some Lancaster County streams are at risk from lack of adequate base flow, which could affect aquatic life and permitting for water withdrawals. Existing water and sewer infrastructure is failing yet the system continues to be expanded without adequate consideration of the future costs of repair and replacement.

Deciding which steps should be taken to address the many water resource issues faced today is not easy. *Blueprints* provides a framework for moving forward in a comprehensive, coordinated and integrated manner.

Benefits of applying systems thinking to water resources management:

- Shared responsibility for implementation
- Access to new sources of funding
- Increased public awareness about water resource issues
- Increased likelihood of success!

Strategic Vision

Blueprints envisions a future in which a sustainable supply of clean water is available to support a growing population, a strong economy, recreational uses, ecological needs, and the overall health of local waterways and the Chesapeake Bay. Water resources will be integrated into all planning disciplines; and, an engaged, educated public supports efforts to manage water resources in a holistic way that protects and restores water resources for current and future generations.

Goal and Objectives

Unlike other elements of Lancaster County's Comprehensive Plan, which may contain close to a hundred actions, *Blueprints* was developed as a strategic plan containing only three strategies that, when implemented, will ***protect, conserve, and improve surface and groundwater resources for human and non-human use.***

Recognizing the connection between smart

growth and water resources protection and restoration, the strategies outlined in *Blueprints* focus on implementing *Balance, The Growth Management Element of Lancaster County's Comprehensive Plan*. Increasing investments in green infrastructure for stormwater management and water quality improvement, a concept which was introduced in *Greenscapes, The Green Infrastructure Element of Lancaster County's Comprehensive Plan,* is another key priority for *Blueprints*.

To realize the goal of protecting, conserving and improving water resources, the following objectives must be met.

1. Provide water, sewer and stormwater infrastructure to accommodate 85% of future growth in Urban Growth Areas.
2. Deliver essential infrastructure services to both urban and rural settlements in a cost effective manner.
3. Reduce the number of miles of impaired streams.
4. Institutionalize Integrated Water Resources Management in Lancaster County.
5. Increase the use of green infrastructure in water resources management.

Blueprints provides a framework for institutional change necessary to reach these objectives and lead to water quality improvement for Lancaster County.

Planning Process

Stakeholder Input

Blueprints was prepared by the Lancaster County Planning Commission with input from the public, private, and non-profit sectors. Input received at forums, events, and stakeholder discussions helped frame the vision, goals, objectives and strategies outlined in this plan.

Development of *Blueprints* began in April 2008 with a *Water Resource Issues Forum* where a group of stakeholders, including representatives from state and local government, non-governmental organizations (NGOs), water/sewer authorities, manufacturing and agricultural sectors, identified the primary water resource issues affecting implementation of *Balance*. Those issues included:

Green Versus Gray Infrastructure

In general, the term "Green Infrastructure" is used to describe the substructure that supports life itself. It's the resources that perform important ecological functions that produce oxygen for us to breath and clean water for us to drink. On the other hand, "Gray Infrastructure" refers to the engineered systems that support the functions of communities. Roads, bridges, sewer and water lines, and storm sewers are all examples of gray infrastructure.

Green infrastructure can be applied to the landscape in different ways to mitigate the impacts of urban development, suburban sprawl, and rural land uses such as agriculture. Trees, for example, can be used to perform important ecological functions that help clean our air and water. In agricultural areas, trees planted along waterways (called "riparian buffers") enhance water quality by reducing stream bank erosion, absorbing nutrients and soil from farmland runoff, and shade streams to cool the water. In urban and suburban areas, trees can be used to absorb storm water and reduce runoff, shade and cool macadam and concrete surfaces, and filter air pollutants.

In addition to improving air and water quality, green infrastructure provides additional benefits to a community. Increasing tree canopy and green vegetation is visually pleasing, softening the built environment and improving the sense of well-being of its residents.

- **Stormwater Management**. Significant problems, including uncontrolled runoff, undersized drainage system, and flooding have been identified in the Conestoga, Chiques, Little Conestoga, and Cocalico Creek watersheds. Effective use of green infrastructure, ownership and maintenance of stormwater infrastructure, regional stormwater management, and lack of funding were also identified as critical issues to be addressed in *Blueprints*.
- **Water/Sewer Infrastructure**. Water and sewer infrastructure is essential to accommodate the level of development called for in our urban areas. However, the improper placement of infrastructure can lead to unchecked growth that places the county's farmland and natural areas at risk. On the other hand, lack of sufficient infrastructure, is also an impediment to effective growth management.
- **Quality/Quantity/Source**. Lancaster County possesses more than 824 miles of "impaired" streams. The Pennsylvania Department of Environmental Protection (DEP) cites the predominant source of impairment as "agriculture." Meanwhile, as efforts are being made to reduce pollutant discharges to our waterways, our population is growing, resulting in increased pollutant loads. Also, our water supply is subject to climatic variability and strain from development pressures, resulting in hardships on homeowners and businesses and potential implications to our economy.

While the impairment of the Chesapeake Bay was discussed at the Issues Forum, participants ultimately agreed that tackling the above list of "local" issues represented a logical approach to addressing broader watershed issues, such as the cleanup of the Chesapeake Bay.

Water Resources Advisory Committee

In May 2008 the Lancaster County Planning Commission established an Advisory Committee to provide input and guidance on *Blueprints*. Each issue (stormwater management, water/sewer infrastructure, and quality/quantity/source) was then discussed in a series of meetings with key individuals knowledgeable on the specific issue. These workgroups were charged with recommending strategies to address the identified issues. The Advisory Committee was responsible for assessing the strategies developed by the workgroups and advising the LCPC staff on the development of an integrated water resources plan.

Act 167 Plan Advisory Committee

In compliance with the requirements of the Pennsylvania Storm Water Management Act (Act 167), a separate Watershed Plan Advisory Committee (PAC) was established to advise county staff on the Plan and model stormwater management ordinance, evaluate policy and project alternatives, coordinate ordinance development with other municipal plans and programs, and review the plan prior to adoption.

Presentations

LCPC staff gave many presentations on the developing *Blueprints* between April 2008 and June 2012. These presentations afforded staff the opportunity to gather input from various groups throughout the planning process.

Following is a list of some of the presentations given:

- Pennsylvania Municipal Authorities Association 2009 Annual Conference
- American Society of Landscape Architects Pa-De Chapter 2012 Annual Conference
- Pennsylvania Chapter of American Planning Association 2011 Conference
- Chesapeake Bay Commission (Sept. 2010)
- Lower Susquehanna Source Water Protection Building a Regional Partnership Meeting (Feb. 2011)

- Denver Borough Planning Commission (March 2012)
- Lancaster Chamber Issues Forum (April 2012)
- West Hempfield Township Planning Commission (June 2012)
- PADEP First Annual Source Water Protection Conference (June 2012)

Public Meeting and Public Comment Period

The *Blueprints* draft was presented at a public meeting of the Lancaster County Planning Commission. The public was invited to review and comment on *Blueprints* in accordance with the requirements of the MPC and Act 167.

Public Hearing and Adoption

A public hearing was held by the Board of County Commissioners on September 19, 2012. The Board of County Commissioners adopted *Blueprints* by unanimous vote on October 10, 2012.

Organization of the Plan

Blueprints is organized as follows:

Chapter 1 Introduction. This chapter summarizes the strategic vision, goals, objectives and strategies contained in *Blueprints*, describes the public involvement process, summarizes the key to successful implementation and explains the regulatory requirements met through the plan.

Chapter 2 The Water Resource System. This chapter contains a description of Lancaster County's water resource system and factors that influence those resources such as land use and demographics.

Chapter 3 Strategic Plan. This chapter includes the outcomes of the planning process wherein each issue (stormwater management, water/sewer infrastructure, and quality/quantity/source) was discussed in depth by a group of knowledgeable stakeholders. Alternative strategies for addressing the issue were considered, ultimately resulting in the preferred strategies for meeting the objectives of the Plan. The following strategies are explained in this chapter:

- Collaborate
- Accelerate implementation of existing plans
- Improve planning and design

Chapter 4 Roles and Responsibilities. This chapter describes in broad terms the roles of the public, private and not-for-profit sectors in water resources planning and management. The specific roles and responsibilities related to the implementation of *Blueprints* are defined in Chapter 3.

Chapter 5 Summary of Existing Plans. This chapter includes a summary of many of the plans and studies for the water resources of Lancaster County. While some of these plans are being implemented or used as guidance, many are not. This section should be used as a reference for gaining an understanding of the water resource system within a particular watershed and for implementing the strategies in this plan.

Chapter 6 Tools and Resources. This chapter includes the tools, such as model ordinances, and resources that can be used in implementing *Blueprints*.

Implementing *Blueprints*

Blueprints is the first integrated water resources plan adopted by Lancaster County and the first of its kind in Pennsylvania. The plan helps draw connections among many water resource management issues, providing a framework for integration of various programs. Unfortunately, integrated water resources planning, while commendable in theory, has seen limited success in large part due to the lack of understanding about the importance of and need for collabo-

ration. Consequently, *Blueprints* calls for the County to periodically convene key stakeholders for the purpose of facilitating collaboration and advancing integrated water resources planning and management.

To further ensure successful implementation, the LCPC will have primary responsibility for monitoring progress and reporting back to key stakeholders on a regular/annual basis.

Regulatory Requirements and Planning Context

Blueprints meets the requirements of the Pennsylvania Municipalities Planning Code (Act 247) and the Pennsylvania Storm Water Management Act (Act 167). In an effort to advance integrated water resources planning and management, the following state and federal statutes were also taken into consideration in developing the strategies for *Blueprints*:

- The Pennsylvania Sewage Facilities Act (Act 537)
- The Federal Clean Water Act
- The Federal Safe Drinking Water Act

Blueprints was developed during a time when many water resource-related planning efforts were taking place, including an update to the State Water Plan (Act 220) and development of the Chesapeake Bay Total Maximum Daily Load (TMDL) and its companion the Pennsylvania Chesapeake Watershed Implementation Plan (WIP). Each of these plans helped shape *Blueprints*. The Susquehanna River Basin Commission's Comprehensive Plan (2008), annual Water Resources Program and Groundwater Management Plan were also considered in the development of *Blueprints*.

Many municipal and multi-municipal planning efforts took place during the development of *Blueprints*, including several municipal Act 537 Sewage Facilities Plans, source water protection plans, and a Green Infrastructure Plan developed by the City of Lancaster to address combined sewer overflows.

Several of these planning initiatives helped to inform this IWRP and in some cases served as opportunities for piloting some of the strategies that were developed early in the planning process. Descriptions of those pilot activities are located throughout *Blueprints*.

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CHAPTER 2

The Water Resource System

To help the reader gain a better understanding of the county's extensive water resource system, this section of *Blueprints* includes a general description of the various components of and influences on the water resource system, including the following:

- Land use and demographics
- Natural features / Green Infrastructure
- Grey Infrastructure
- Existing drainage problems

A *Water Resources Atlas* with more extensive information about the water resources of Lancaster County will be compiled as part of the implementation of this plan.

Land Use/Demographics

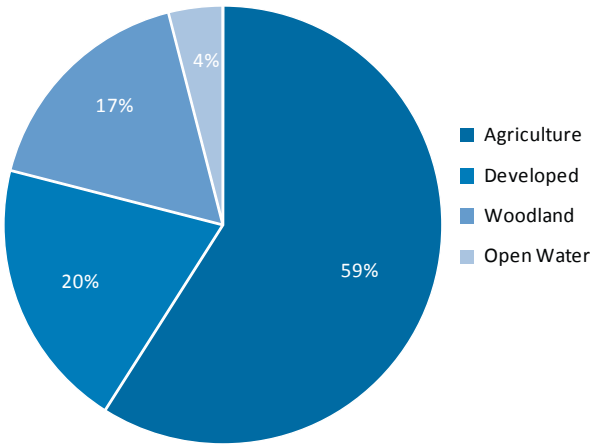
Major land uses within the county include agriculture (59%), developed (20%), woodlands (17%), and open water (4%). See **Chart 1**.

While agriculture is the predominant land use in the county and the greatest source of impairment of our local streams, developed areas of the county also contribute to the degradation of the county's water resources. The stormwater runoff generated from developed areas often carries contaminants, such as sediments, fertilizers and oils which can pollute our streams. Large impervious surfaces that prevent groundwater recharge can also impact base flow of streams during dry weather periods.

Lancaster County has been one of the fastest growing counties in Pennsylvania during the last several decades. From 1980 to 2010 the County's population grew from 362,346 to 519,445, an increase of just over forty percent in only thirty years. The Lancaster County Planning Commission projects that the county's population will increase to approximately 613,000 by 2030.

To achieve the objectives articulated in *Balance, The Growth Management Element of the County's Comprehensive Plan*, roughly 79,522* additional residents will need to be accommodated in the 16% of the land area identified as Urban Growth Areas. See **Map 1**. The *balance* of the population growth should be directed to Rural Centers, including Village Growth Areas, Crossroads Communities, Rural Business Areas and Rural Neighborhoods.

Chart 1: Land Use, Lancaster County, PA

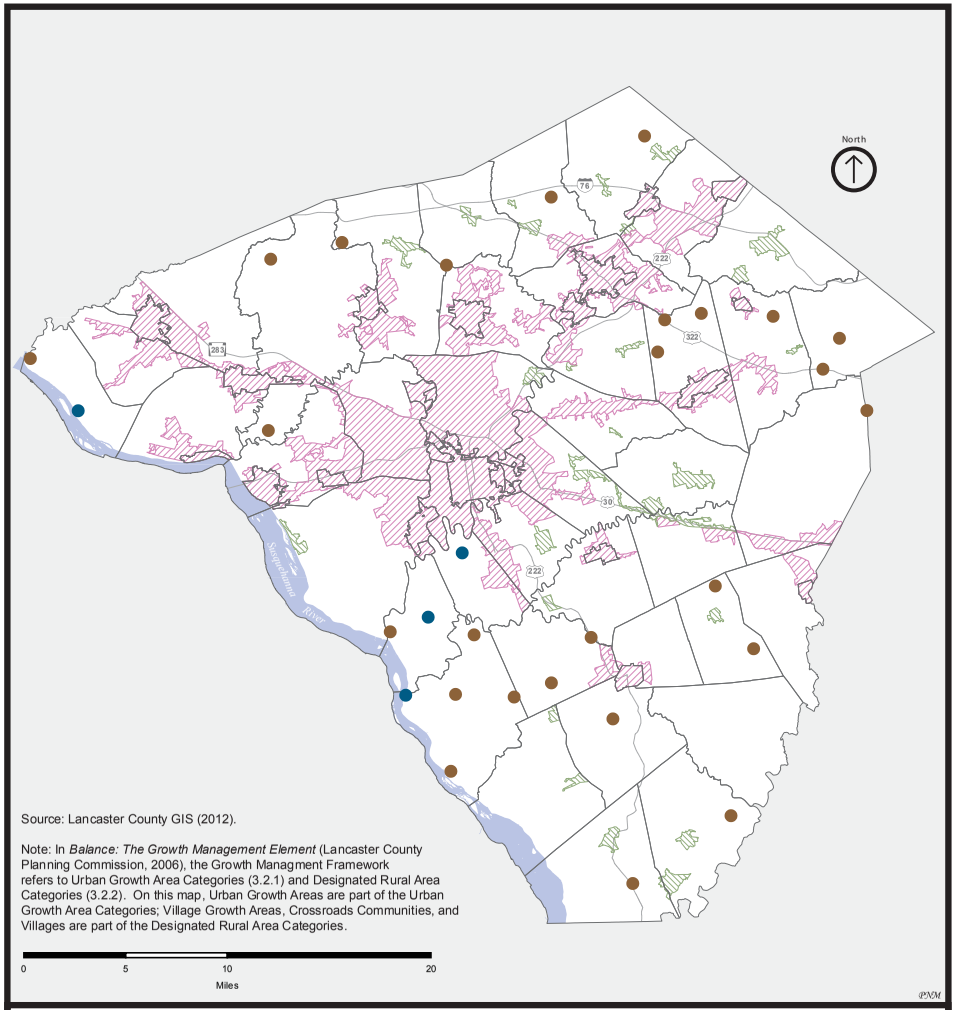


Source: Lancaster County GIS; Lancaster County Land Use/Land Cover Data; Ground Conditions, Spring 2008

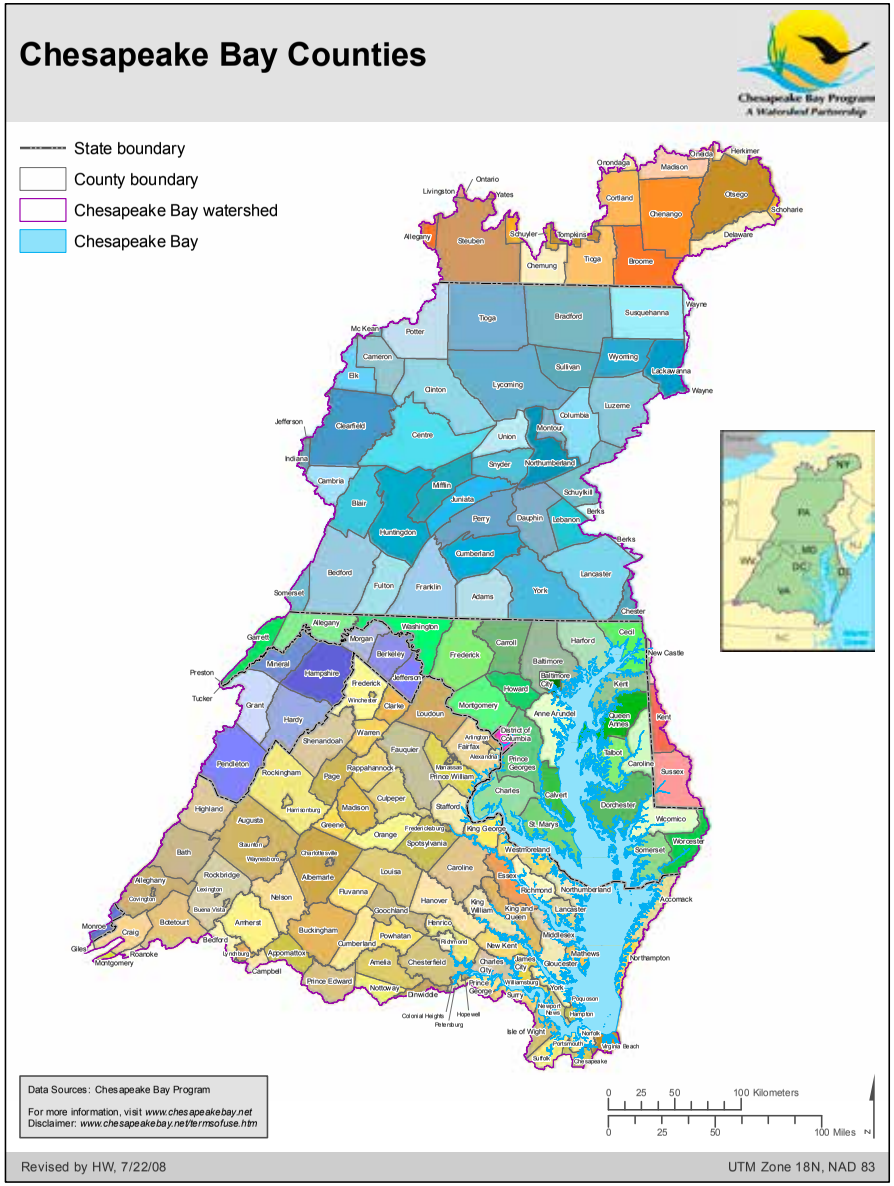
* (2030 population – 2010 population) x .85

Lawful activities such as extraction of minerals and commercial agricultural production may impact water supply sources and such activities are governed by statutes regulating mineral extraction that specify replacement and restoration of water supplies affected by such activities. Commercial agriculture production may impact water supply sources.

Map 1: Growth Management Areas, Lancaster County, PA



Map 2: Counties and States Comprising the Chesapeake Bay WatershedChesapeake Bay Watershed



Natural Features/Green Infrastructure

Watersheds

With the exception of a very small area of Caernarvon and Salisbury Townships which is part of the Delaware River Basin, Lancaster County lies entirely within the Lower Susquehanna River Basin of the Chesapeake Bay Watershed. See **Map 2**.

The County is comprised of thirty-eight (38) watersheds. See **Map 3**. The watershed boundaries shown are based on Hydrologic Unit Codes as defined by the Natural Resources Conservation Service. Lancaster County's watersheds have been described in different ways in the past and variations on what constitutes a given watershed can be found throughout various planning and management documents. While this plan includes maps which show these different boundaries, the HUC 12 watershed boundaries are based on a commonly understood definition and therefore are the preferred watershed reference used in *Blueprints.*

Geology/Karst Features

Lancaster County is located in the Piedmont portion of Pennsylvania, with the Coastal Plain to the southeast and the ridge and valley area to the north and west. The Piedmont area is characterized by sloping and hilly land. The central portion of the county (the Conestoga River Valley) is underlain by limestone and a region of limestone and schist. South of the limestone and schist area, in the southern portion of the county, the bedrock consists of schist, quartzite, and gneiss. The boundary between the limestone/schist and the schist, quartzite, and gneiss is a thrust fault known as the "Martic line", and includes the ridge line known as "Mine Ridge" which runs east-west along the south end of Salisbury, Paradise, and Strasburg Townships. The entire Conowingo watershed, most of the Octoraro, and a large portion of the watershed that drains directly into the Susquehanna River are located south of the Martic line. See **Maps 4 and 5.**

Surface Water

There are over 1,400 miles of streams and creeks in Lancaster County, including approximately 330 miles classified as Special Protection Waters (High Quality or Exceptional Value). See **Map 6**.

According to the 2012 Draft Integrated List (303d) from Pennsylvania Department of Environmental Protection, 824 miles of streams are considered "impaired.**" See **Map 8**. The Pennsylvania Department of Environmental Protection cites the predominant source of impairment as agriculture. However, stormwater runoff from urbanized areas of the county is a growing source of contamination. Although not mentioned specifically, historic changes to the landscape, including the construction of mill dams and the resulting "legacy sediment," are another factor impacting our surface water bodies.

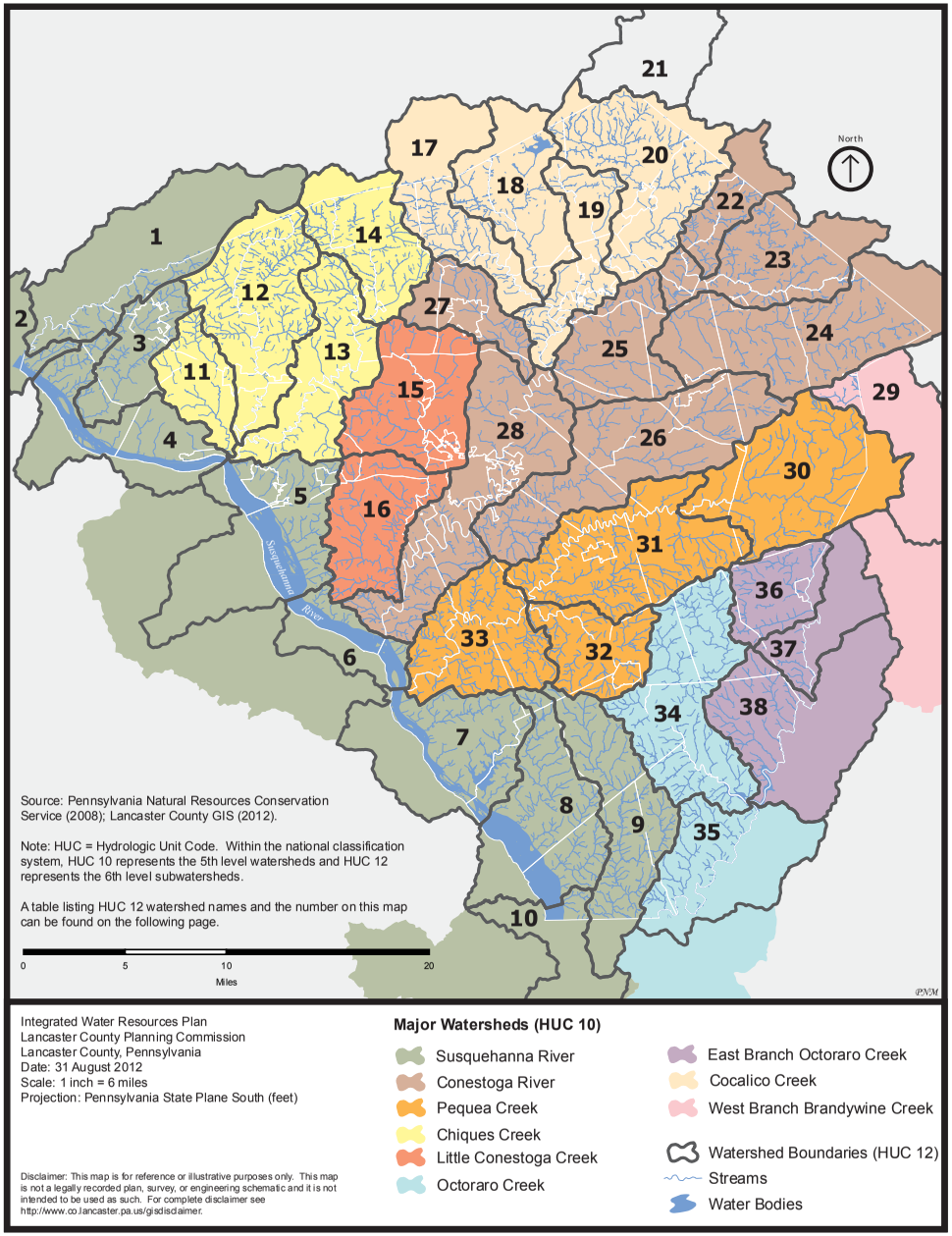
Streams listed on the 303d list are required to have a Total Maximum Daily Load (TMDL). A TMDL calculates the maximum amount of a pollutant allowed to enter a water body so that it will meet and continue to meet water quality standards for that particular pollutant and allocates that load to point sources (waste load allocations) and nonpoint sources (load allocations). See **Map 7**. As of September 2011, TMDLs have been established for impaired stream segments within the following watersheds:

- Chiques Creek
- Conewago Creek
- Conowingo Creek
- Donegal Creek
- Lititz Run (a sub-watershed in the Conestoga River basin)
- Mill Creek (unnamed tributary to Mill Creek)
- Muddy Run (a sub-watershed within the

** Special protection waters may also be impaired.

Map 3: Major Watersheds and Subwatersheds, Lancaster County, PA

Number	HUC 12 Watershed Name
Susquehanna River	
1	Conewago Creek
2	Laurel Run-Susquehanna River
3	Conoy Creek
4	Hartman Run-Susquehanna River
5	Cabin Creek-Susquehanna River
6	Green Branch-Susquehanna River
7	Muddy Run-Susquehanna River
8	Fishing Creek-Susquehanna River
9	Conowingo Creek
10	Conowingo Dam-Susquehanna River
Chiques Creek	
11	Donegal Creek
12	Little Chiques Creek
13	Lower Chiques Creek
14	Upper Chiques Creek
Little Conestoga Creek	
15	Millers Run-Little Conestoga Creek
16	West Branch Little Conestoga Creek-Little Conestoga Creek
Cocalico Creek	
17	Hammer Creek
18	Middle Creek
19	Cocalico Creek-Conestoga River
20	Little Cocalico Creek-Cocalico Creek
Tulpehocken Creek	
21	Spring Creek
Conestoga River	
22	Little Muddy Creek
23	Muddy Creek
24	Upper Conestoga River
25	Middle Conestoga River
26	Muddy Run-Mill Creek
27	Lititz Run
28	Lower Conestoga River
West Branch Brandywine Creek	
29	Upper West Branch Brandywine Creek
Pequea Creek	
30	Headwaters Pequea Creek
31	Eshleman Run-Pequea Creek
32	Big Beaver Creek
33	Climbers Run-Pequea Creek
Octoraro Creek	
34	West Branch Octoraro Creek
35	Tweed Creek-Octoraro Creek
East Branch Octoraro Creek	
36	Pine Creek
37	Valley Creek-East Branch Octoraro Creek
38	Muddy Run-East Branch Octoraro Creek



Source: Pennsylvania Natural Resources Conservation Service; 2008

Conestoga River basin)
- Pequea Creek

In addition, TMDLs are currently being developed for the Conestoga River and Octoraro Creek watersheds. The existence of a TMDL may have implications for those subject to National Pollutant Discharge Elimination System (NPDES) permits, such as wastewater treatment facilities with stream discharges, owners of Municipal Separate Storm Sewer Systems (MS4s), Concentrated Animal Feeding Operations (CAFOs), and builders.

Wetlands also play a critical role in effective water resources management. They improve water quality, maintain surface water flow, replenish ground water reservoirs, and prevent water logging of crops during flooding. As stormwater runoff flows through wetlands, decreased water velocity allows sediment to settle out, and native plant species absorb or break down various pollutants.

Many wetlands have been drained to create fields or farm ponds for agricultural production. Because of the benefits to water quality and supply, it is important to preserve, improve, and restore wetlands. The Natural Heritage Inventory of Lancaster County, PA (2008) identifies locations throughout the county where special consideration should be given to wetlands preservation and restoration.

Groundwater

Groundwater is not only a significant source of drinking water*** but is necessary for maintaining base flow in our streams and wetlands. There is evidence that water withdrawals could exceed availability in the Conestoga River and Chiques Creek watersheds as indicated by the nomination of these watersheds as Critical Water Planning Areas. Because these areas exhibit karst conditions there has been a reluctance to infiltrate stormwater, which is essential to sustaining an adequate water supply to meet future needs.

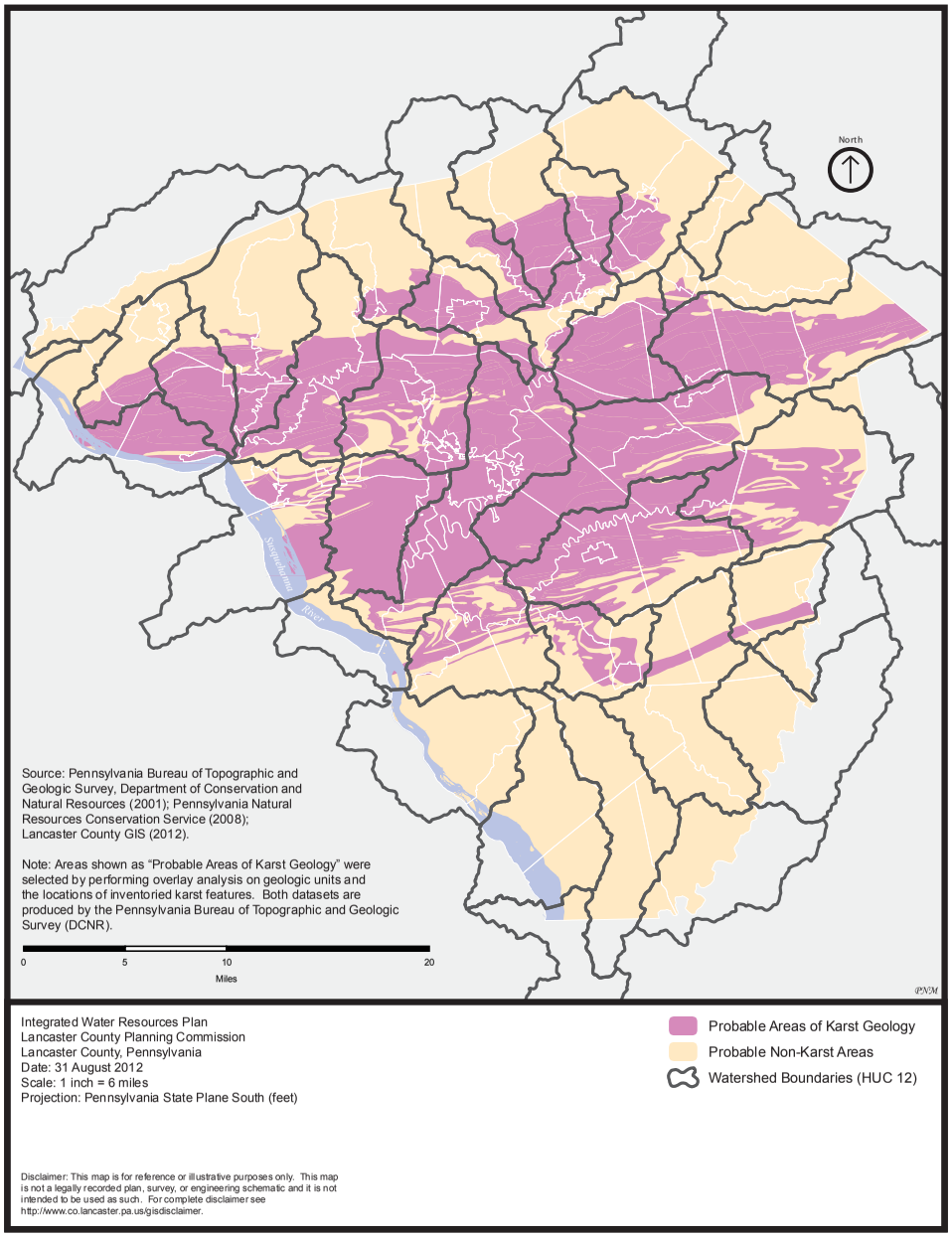
The quality of groundwater in Lancaster County has the potential to be influenced by many activities such as agricultural operations, improper handling or disposal of hazardous materials, excess fertilizer applications, on-lot sewage disposal, and more. By far, the most significant groundwater contaminant in the county is nitrates. Many areas of the county have nitrate levels that exceed the drinking water standard of 10 parts per million. In addition to driving up the cost of providing potable water, elevated nitrate levels in groundwater can limit on-site wastewater disposal alternatives. This has been an issue in the eastern part of the county where there are broad occurrences of high nitrates in groundwater.

Floodplains

Lancaster County's floodplains have been altered quite dramatically over the last couple centuries. One of the activities that most dramatically impacted our floodplains was the establishment of as many as 400 mill dams on many of our waterways. On average, there was roughly one mill dam every 1.74 miles of stream length (Merritts and Walter, 2003). While many of the mills and associated dams have disappeared, the sediment that built up behind the dams still remains. In some areas these "legacy sediments" are as much as twenty feet deep. According to Dorothy Merritts and Robert Walter, professors in the Earth and Environment department at Franklin & Marshall College, the water that once flowed over the dams began cutting narrow channels down through the sediment accumulated on top of the original floodplain. This resulted in the

*** Twenty-six public water systems serving approximately 26% of the population rely on groundwater as their primary or sole source of supply water as do those living outside public water service areas that rely on individual private wells. During periods of drought many of these systems have experienced unproductive wells.

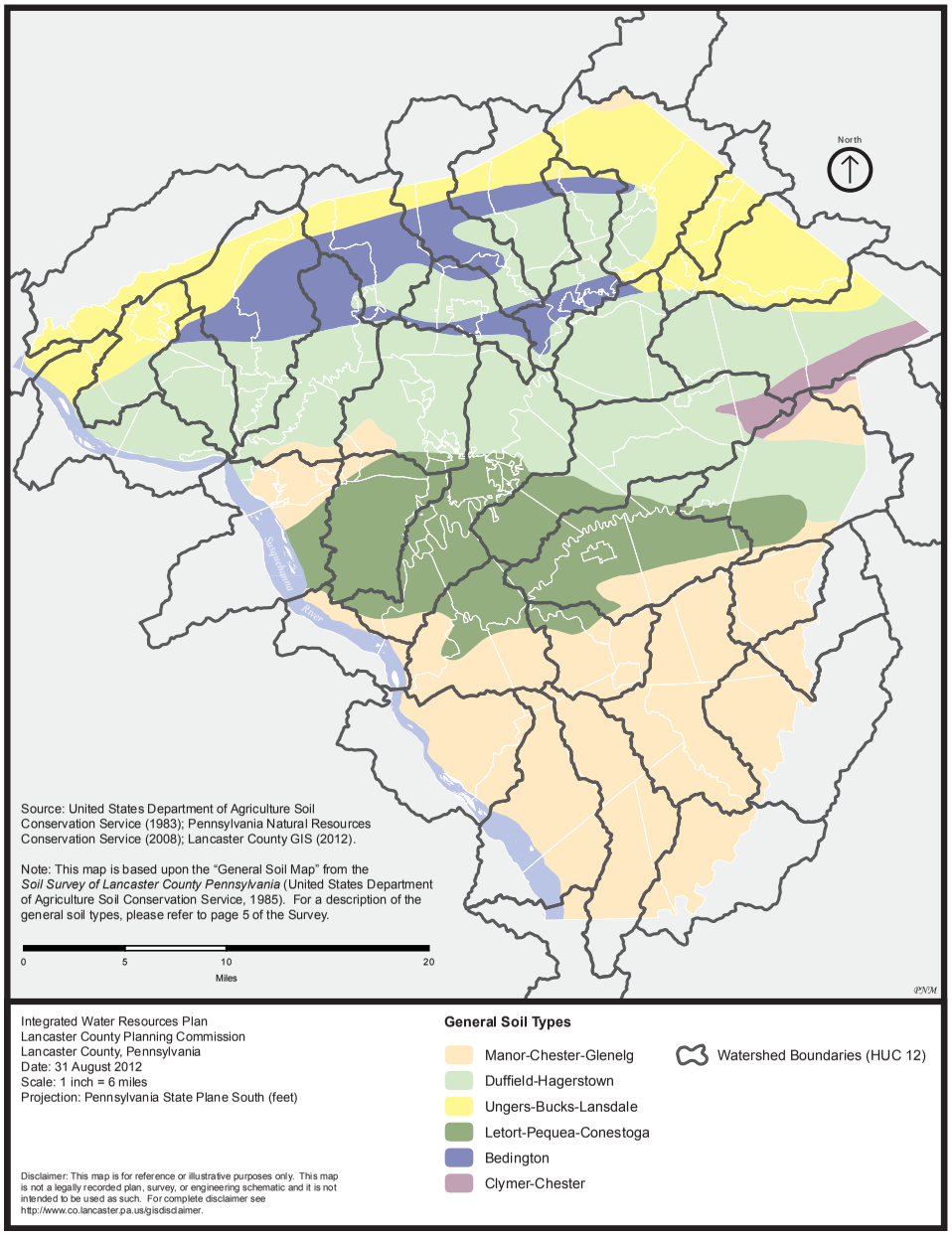
Map 4: Karst Geology of Lancaster County, PA



Integrated Water Resources Plan
Lancaster County Planning Commission
Lancaster County, Pennsylvania
Date: 31 August 2012
Scale: 1 inch = 6 miles
Projection: Pennsylvania State Plane South (feet)

- Probable Areas of Karst Geology
- Probable Non-Karst Areas
- Watershed Boundaries (HUC 12)

Map 5: General Soils of Lancaster County, PA



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Lancaster County, Pennsylvania
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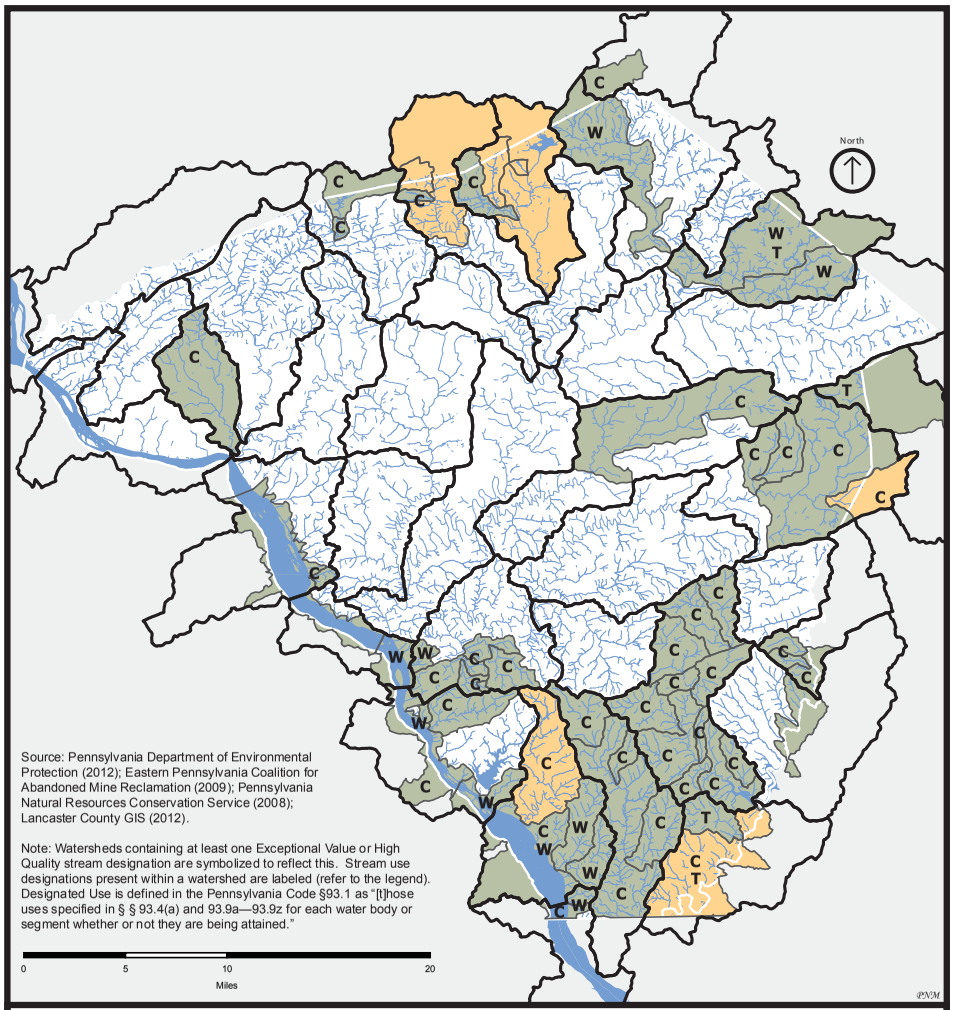
Projection: Pennsylvania State Plane South (feet)

General Soil Types

- Manor-Chester-Glenelg
- Duffield-Hagerstown
- Ungers-Bucks-Lansdale
- Letort-Pequea-Conestoga
- Bedington
- Clymer-Chester
- Watershed Boundaries (HUC 12)

Map 6: Exceptional Value and High Quality Designated Use Watersheds in Lancaster County, PA



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Lancaster County, Pennsylvania
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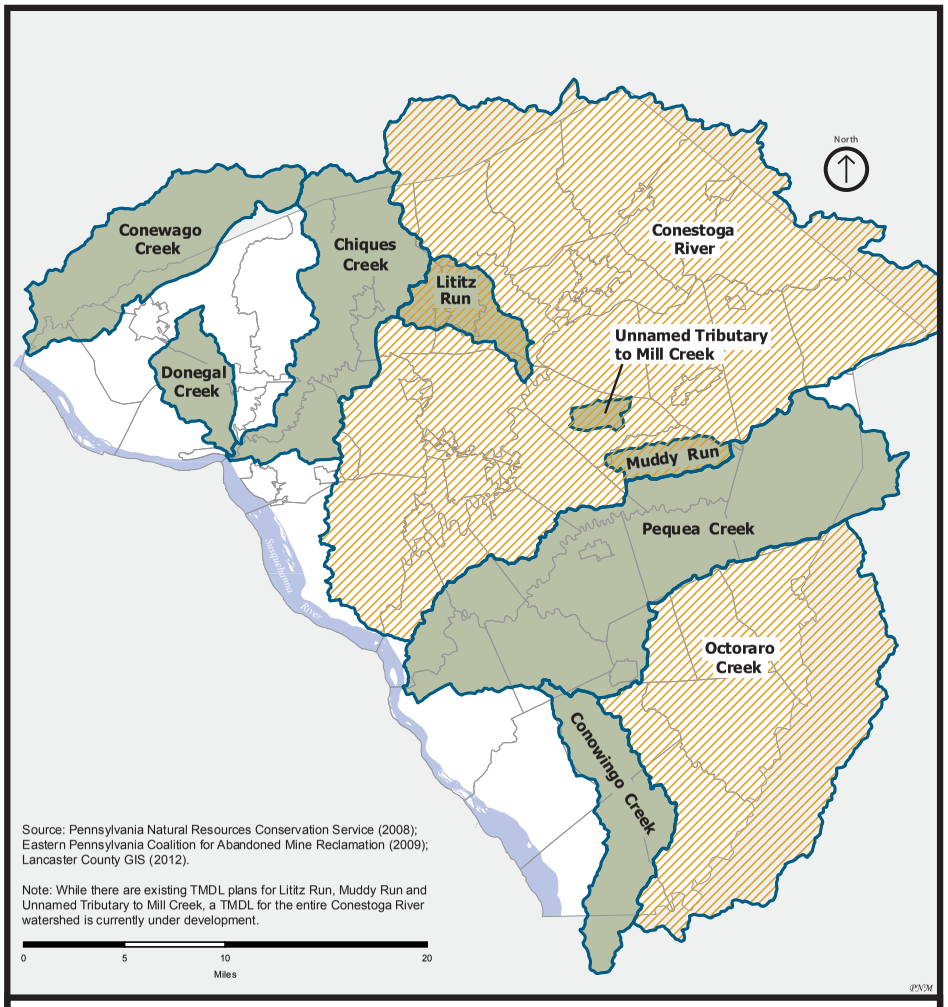
Scale: 1 inch = 6 miles
Projection: Pennsylvania State Plane South (feet)

Stream Use Designations

- Exceptional Value Waters
- High Quality Waters
  - **C** - High Quality Cold Water Fish
  - **W** - High Quality Warm Water Fish
  - **T** - High Quality Trout Stocking
- Watershed Boundaries (HUC 12)
- Streams
- Water Bodies

Map 7: Watersheds with Approved Total Maximum Daily Loads (TMDL), Lancaster County, PA



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Lancaster County, Pennsylvania
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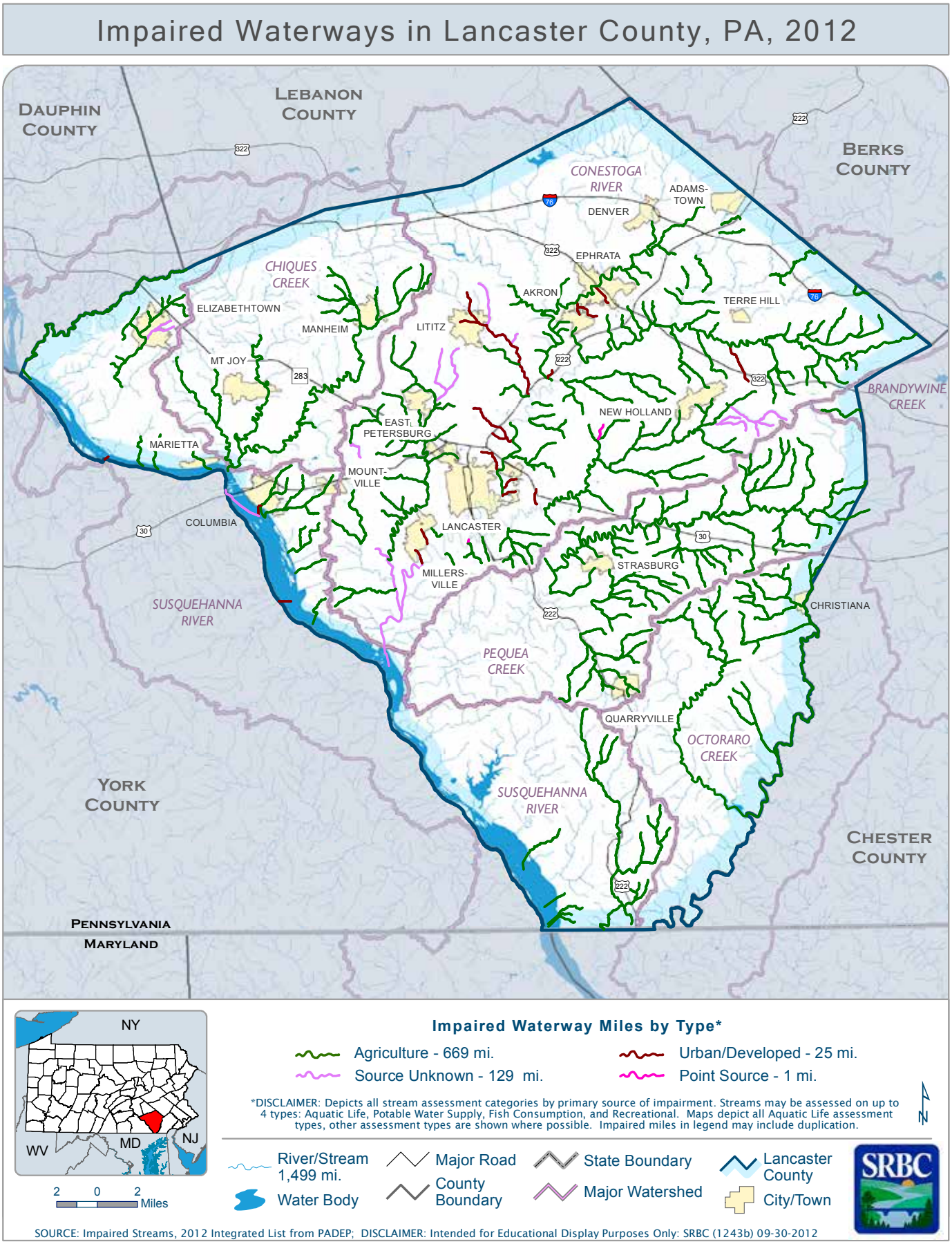
Scale: 1 inch = 6 miles
Projection: Pennsylvania State Plane South (feet)

TMDL Plan Status

- Approved
- In-progress
- Municipal Boundaries

Map 8: Impaired Waterways in Lancaster County, PA (2012)



Three public drinking water systems serving 31% of the population in the county rely on surface water as their primary water supply source. They include the following:

- City of Lancaster
- Ephrata Area Joint Authority
- Columbia Water Company

disconnection of the stream from the floodplain, minimizing the natural functions of the floodplain.

Greenscapes, calls for the conservation of the 100-year floodplain as well as restoration of low quality streams, including those identified as Priority Habitat Restoration Areas. Efforts to restore the floodplain have already taken place in some areas of the county. The most notable projects are located in the Lititz Run watershed and include the New Street Ecological Park and Santo Domingo Creek restorations. These projects were both designed to demonstrate the many benefits of floodplain restoration, including water quality improvement, groundwater recharge within a karst environment, and regional stormwater management. For more on the practice of floodplain restoration, see *Floodplain Restoration* (LandStudies, Inc. 2010).

For specific floodplain mapping including available mapping of legacy sediments, contact the Geographic Information System (GIS) Division of the Lancaster County Information Technology Department. For detailed recommendations regarding priority floodplain restoration locations, refer to *Greenscapes, Section 3.3.1 Hubs and Greenways* (LCPC, 2009).

Tree Canopy / Riparian Corridors

Tree canopy is the layer of leaves, branches and stems of trees that cover the ground when viewed from above. Trees, a vital part of any green infrastructure system, store water, clean the air, filter and cool water, recycle nutrients, reduce storm and flood damage, and recharge groundwater aquifers. Depending on size and species, the National Arbor Day Foundation estimates that a single tree may store 100 gallons of water or more before it reaches its saturation after about one to two inches of rainfall. Studies have shown that as much as 65 percent of stormwater runoff can be reduced when trees are combined with other natural landscaping.

Just as the quantity of water in a stream can be affected by the amount of impervious surface

Designations to Be Aware of...

Critical Water Planning Areas

The State Water Plan allows for the identification of **Critical Water Planning Areas.** The Conestoga River and Chiques Creek watersheds have shown indications of low base flow conditions which have the potential to impact aquatic resources. Both were nominated as Critical Water Planning Areas by the Lower Susquehanna Sub-committee to the State Water Plan Committee. While neither of these watersheds rose to the level of being designated as such under the Water Resources Planning Act of 2002 (Act 220), the data are indicative of potential water resource conflicts, which should be considered by local planning efforts.

Designations to Be Aware of...

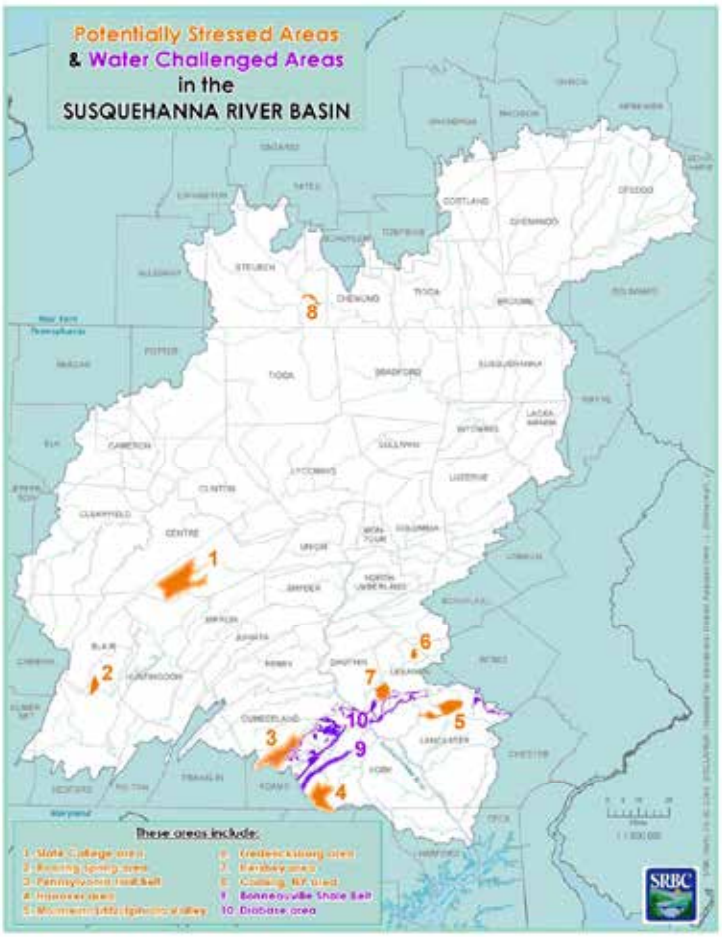
Potentially-Stressed Areas

In Potentially-Stressed Areas, "the demand for and use of water resources are potentially approaching or have exceeded the sustainable limit." Potentially-Stressed Areas generally meet two or more of the following criteria:

- Diminished yields
- Declining water levels
- Diminishing stream or spring flows
- Expanded dry stream reaches
- A water budget analysis indicating that withdrawals within a groundwater basin exceed the recharge during a 1-in-10-year average annual drought
- Known withdrawals for rapidly developing areas exceeding 50 percent of the recharge during a 1-in-10-year average annual drought

One Potentially-Stressed Area has been identified in Lancaster County – Manheim/ Lititz/Ephrata region. See **Map 9.**

Map 9: Potentially-Stressed Areas and Water Challenged Areas in the Susquehanna River Basin



Water Challenged Areas

Water Challenged Areas have "natural conditions that strongly limit the amount of water resources available and will support very little water resource development." One Water Challenged Areas has been identified in Lancaster County – a diabase area found in a narrow band that runs through Adams, York, Dauphin, Lancaster, Lebanon, and Berks Counties. This area has one of the lowest yielding aquifers in the Susquehanna River basin.

Potentially-Stressed Areas may face greater scrutiny when applying for withdrawal permits from the Susquehanna River Basin Commission. SRBC is considering the use of a Special Protected Areas designation in potentially stressed and water challenged areas. Protection standards would accompany this designation. Refer to the SRBC Comprehensive Plan for more information on Potentially-Stressed Areas and Water Challenged Areas.

Designations to Be Aware of...

Critical Aquifer Recharge Areas

Critical Aquifer Recharge Areas (CARAs) are areas characterized by features or attributes that provide an exceptional amount of replenishment (recharge) to the aquifer per unit area. A 2005 evaluation of the Manheim-Lititz and Ephrata area groundwater basins, conducted by the Susquehanna River Basin Commission, identified four CARAs in the seventy square mile study area shown on **Map 10** (taken from SRBC report Executive Summary, page v). They included dry valleys, losing stream reaches, siliciclastic to carbonate stream crossings and karst modified uplands.

CARAs can play a critical role in integrating water supply efforts and sustainable stormwater management. For more information on CARAs, refer to the *Northern Lancaster County Groundwater Study: A Resource Evaluation of the Manheim-Lititz and Ephrata Area Groundwater Basins* (SRBC, September 2005)

Map 10: Critical Aquifer Recharge Areas, Northern Lancaster County Groundwater Study

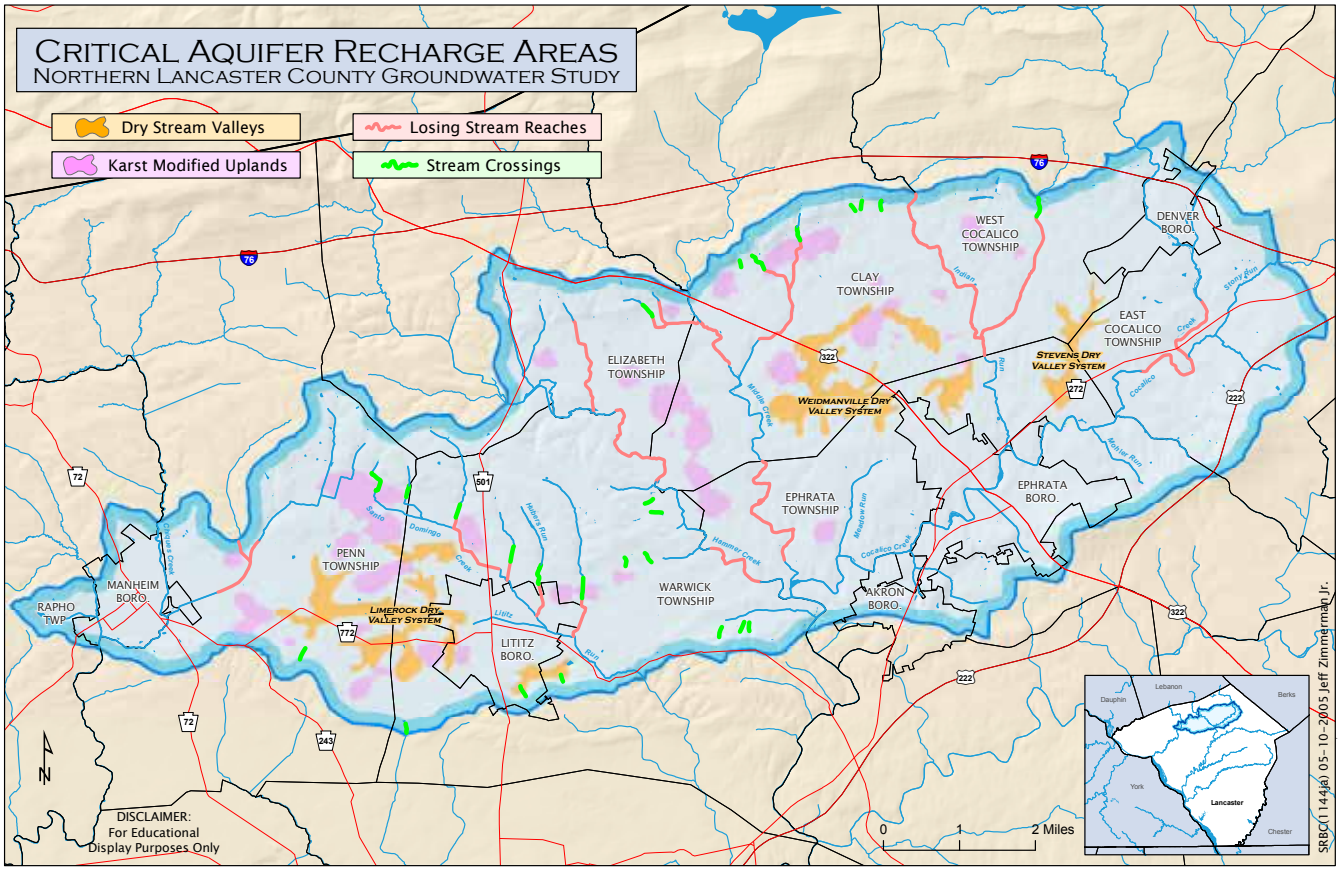


Table 1: Tree Canopy Acreages, Lancaster County, PA

COUNTY-WIDE TREE CANOPY LAND COVER ANALYSIS *	Total Land Area (Acres)	Existing TC (Acres)	Existing TC (Percent)
Ag Areas	206,445.41	18,663.22	9.04%
Ag Natural Areas	230,642.12	64,041.59	27.77%
Natural Areas	56,397.50	38,608.62	68.46%
Suburban Built	48,779.03	11,564.83	23.71%
Suburban Future Growth	30,074.88	7,129.58	23.71%
Suburban No Growth	1,214.09	528.90	43.56%
Urban Centers	22,897.98	6,622.11	28.92%
Village Built	5,471.43	1,215.33	22.21%
Village Future Growth	3,763.90	800.98	21.28%
Village No Growth	71.09	36.71	51.65%
Total	**605,757.4**	**149,211.9**	**24.63%**

* Land cover analysis is based on categories outlined in *Balance – The Growth Management Element of the Lancaster County Comprehensive Plan.*

Source: University of Vermont Spatial Analysis Laboratory (2010); Lancaster County GIS (2012)

in a watershed, the percentage of tree cover in a specific land area can be an indicator of the water quality. Those areas with a low percentage of tree canopy, either as part of a watershed or specifically along a stream corridor, often have impaired waters. High percentages of tree canopy, in contrast, are often associated with good stream water quality.

An analysis of the County's tree canopy based on land cover data derived from high-resolution aerial imagery and LiDAR found that 149,212 acres of the county are covered by tree canopy, representing 24.6% of all land in the county. A breakdown of the tree canopy acreages and percentages in each land cover category is provided in **Table 1.**

Analysis of tree canopy in riparian zones and along streams found that 41.1% of the riparian

Table 2: Riparian Zone Tree Canopy Analysis, Lancaster County, PA

RIPARIAN ZONE TREE CANOPY ANALYSIS*	Total Land Area (Acres)	Existing TC (Acres)	Existing TC (Percent)
Ag Areas - 35 foot Buffer	6,703.99	2,754.71	41.09%
Ag Natural Areas - 35 foot Buffer	10,369.71	6,032.04	58.17%
Natural Areas - 300 foot Buffer	16,244.96	10,942.31	67.36%
Suburban Built - 75 foot Buffer	1,896.00	772.14	40.72%
Suburban Future Growth - 75 foot Buffer	2,800.91	1,385.46	49.46%
Suburban No Growth - 75 foot Buffer	142.78	83.30	58.34%
Urban Centers - 35 foot Buffer	551.42	368.23	66.78%
Village Built - 50 foot Buffer	153.20	62.91	41.06%
Village Future Growth - 50 foot Buffer	196.77	101.70	51.68%
Village No Growth - 50 foot Buffer	38.92	27.34	70.26%
Total	**39,098.7**	**22,530.1**	**57.62%**

* Riparian zone analysis is based on categories outlined in *Balance – The Growth Management Element of the Lancaster County Comprehensive Plan.* Riparian zone widths are defined as the minimum needed to achieve reasonable water quality enhancements as well as what is believed practical in each land cover category.

Source: University of Vermont Spatial Analysis Laboratory (2010); Lancaster County GIS (2012)

zone in Agricultural Areas was covered with tree canopy, while in the County's Natural Areas, 67.4% of the riparian zone was covered with tree canopy. A breakdown of tree canopy in riparian zones is provided in **Table 2.**

An analysis of tree canopy by watershed indicates that coverage ranges from a low of 8.4% in the Middle Conestoga River Watershed to a high of 65.0% in the Laurel Run-Susquehanna Watershed. Tree canopy acreages and percentages in each watershed are provided in **Map 11 and Table 3**.

Grey Infrastructure

Grey infrastructure within the water resources context includes water, sewer (including on-lot disposal systems), and stormwater conveyance and treatment facilities. Grey infrastructure is vital to supporting basic community functions as well as protecting the environment.

As is the case across the country, water, sewer and stormwater infrastructure is aging and in need of maintenance, repair and in some cases, replacement[****]. While conducting a full assessment of the costs associated with maintaining and upgrading infrastructure in Lancaster County was beyond the scope of this plan, *Blueprints* does begin to address the issue of affordability and sustainability by evaluating available capacity within the individual systems.

Sewage Facilities

Public sewer services are generally limited to designated growth areas (DGAs), including all Urban Growth Areas (UGAs) and nineteen of the thirty-three Village Growth Areas (VGAs). Approximately 83% of the land within adopted Urban Growth Areas (UGA) is served by public sewers. See **Map 12**.

Coverage ranges from a low of 21% in the Solanco UGA to 98% in the Leola-Bareville UGA. Of the nineteen VGAs with public sewers, coverage ranges from a low of just under 6% in the Oregon VGA to 100% in both Witmer and Smoketown VGAs. Detailed information on coverage within each designated growth area in the county is included in **Table 4**. The balance of the county's wastewater disposal needs is met through private on-lot disposal systems ("OLDS" or "septics") or small private package treatment plants. Twelve municipal Sewage Facilities Plans (Act 537 Plans) identify thirty-three Needs Areas (areas with failing on-lot disposal systems that pose a threat to public health and/or water quality). According to the County's GIS, eleven Needs Areas have been addressed by extending public sewer to the area.

A study of wastewater treatment plant capacity was conducted to assess the capacity of existing facilities to accommodate future growth in Designated Growth Areas (DGAs) through 2030. The study found that of the thirty public wastewater treatment facilities in the county, ten facilities provide 95% of the wastewater treatment capacity in Lancaster County. According to the study there is sufficient treatment capacity within the county to meet future demand based on current discharge limits of 6 mg/l total nitrogen (TN) and 0.8 mg/l total phosphorus (TP).

Because of the potential for capacity to be limited by changes in discharge limits associated with the Chesapeake Bay TMDL, the ability to meet future needs should permit limits be decreased to the current limit of technology (3 mg/l TN and 0.1 mg/l TP) was also evaluated. Should such limits be established, findings indicate that future needs could be met; however, the cost of providing service may be prohibitive. Further analysis is needed to determine whether available capacity aligns with anticipated demand, particularly in light of any changes to permit limits.

**** The U.S. EPA estimated the cost to upgrade water and sewer systems across the United States could be as high as $91 billion in 2010.

Map 11: Percent Existing Tree Canopy by Watershed, Lancaster County, PA

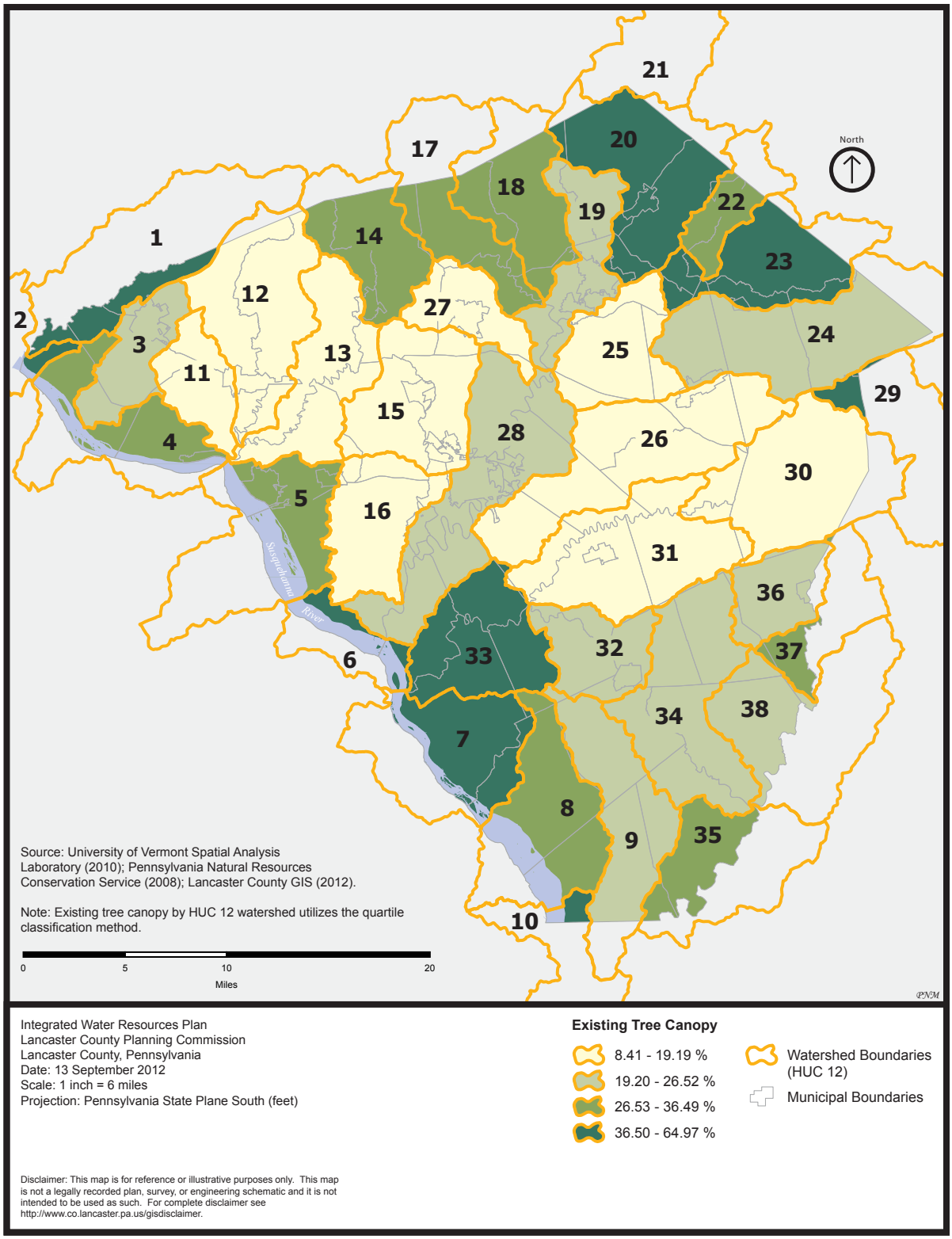


Table 3: Tree Canopy (TC) Acreages and Percentages in Watersheds, Lancaster County, PA

Number	Watersheds (HUC 12)	Total Land Area (Acres)	Existing TC (Acres)	Existing TC (Percent)
1	Conewago Creek	6,238.68	3,211.84	51.48
2	Laurel Run-Susquehanna River	1,268.87	824.33	64.97
3	Conoy Creek	12,144.00	2,973.09	24.48
4	Hartman Run-Susquehanna River	12,005.03	3,186.38	26.54
5	Cabin Creek-Susquehanna River	11,511.08	3,506.97	30.47
6	Green Branch-Susquehanna River	2,563.70	1,155.61	45.08
7	Muddy Run-Susquehanna River	14,830.21	7,156.85	48.26
8	Fishing Creek-Susquehanna River	18,485.22	5,211.72	28.19
9	Conowingo Creek	21,774.54	4,243.15	19.49
10	Conowingo Dam-Susquehanna River	1,193.85	437.40	36.64
11	Donegal Creek	10,960.36	1,245.77	11.37
12	Little Chiques Creek	26,880.76	4,452.88	16.57
13	Lower Chiques Creek	22,149.62	3,193.93	14.42
14	Upper Chiques Creek	15,478.46	4,270.46	27.59
15	Millers Run-Little Conestoga Creek	23,338.20	4,228.21	18.12
16	West Branch Little Conestoga Creek-Little Conestoga Creek	18,465.80	3,526.00	19.09
17	Hammer Creek	11,978.67	4,039.35	33.72
18	Middle Creek	15,873.52	5,702.74	35.93
19	Cocalico Creek-Conestoga River	15,730.12	3,206.14	20.38
20	Little Cocalico Creek-Cocalico Creek	26,089.85	9,611.12	36.84
21	Spring Creek	73.59	34.82	47.32
22	Little Muddy Creek	6,314.07	2,125.33	33.66
23	Muddy Creek	18,500.43	7,052.61	38.12
24	Upper Conestoga River	30,155.99	6,161.93	20.43
25	Middle Conestoga River	17,400.78	1,464.07	8.41
26	Muddy Run-Mill Creek	35,928.34	5,306.78	14.77
27	Lititz Run	11,104.09	1,885.51	16.98
28	Lower Conestoga River	34,706.23	9,194.18	26.49
29	Upper West Branch Brandywine Creek	1,965.79	752.82	38.30
30	Headwaters Pequea Creek	27,774.65	5,187.34	18.68
31	Eshleman Run-Pequea Creek	30,892.31	5,655.62	18.31
32	Big Beaver Creek	13,635.34	3,572.94	26.20
33	Climbers Run-Pequea Creek	21,579.20	8,936.24	41.41
34	West Branch Octoraro Creek	30,470.78	7,167.08	23.52
35	Tweed Creek-Octoraro Creek	10,395.71	3,415.10	32.85
36	Pine Creek	10,471.88	2,158.67	20.61
37	Valley Creek-East Branch Octoraro Creek	3,659.04	1,319.69	36.07
38	Muddy Run-East Branch Octoraro Creek	11,792.43	2,446.39	20.75

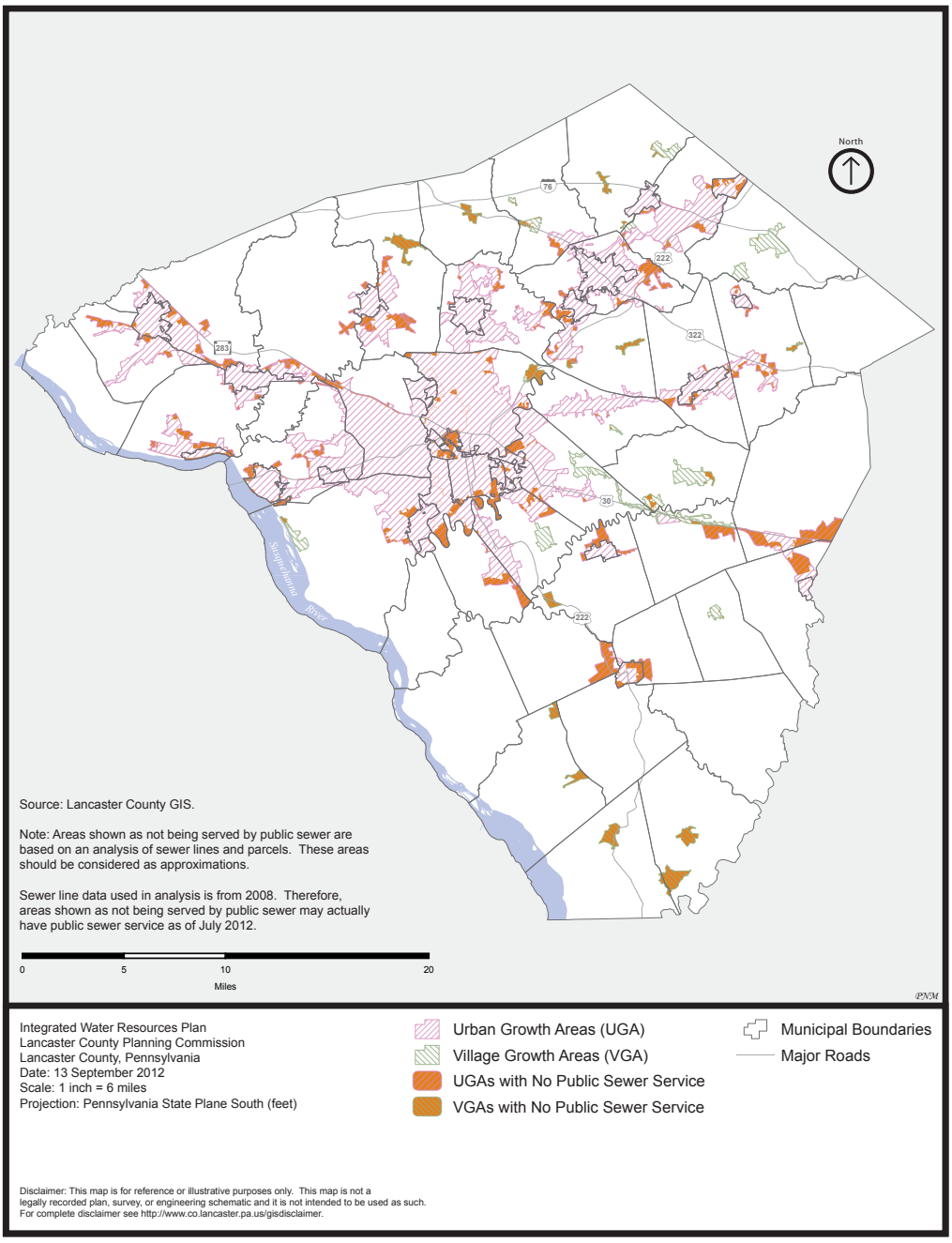
Source: Pennsylvania Natural Resources Conservation Service (2008); University of Vermont Spatial Analysis Laboratory (2010)

Public Water Facilities

According to 2010 data from PADEP's Public Drinking Water System approximately 57% of Lancaster County residents have access to public water. The remainder of the population gets its water from private on-lot wells or private community water systems. The largest community water supplier is the City of Lancaster which provides water to eleven municipalities in the central Lancaster region.

Approximately 77% of the land within adopted UGAs is served by public water. See **Map 13** and **Table 4**. Coverage ranges from a low of

Map 12: Designated Growth Areas Not Served by Public Sewer, Lancaster County, PA



13% coverage in the Christiana-Gap UGA to 93% in the Leola-Bareville UGA. Only one UGA, Paradise Township, has no water service at all. Public water service is available in 6 of the 33 VGAs with coverage ranging from a low of 35% in the Oregon VGA to a high of 100% in

Map 13: Designated Growth Areas Not Served by Public Water, Lancaster County, PA

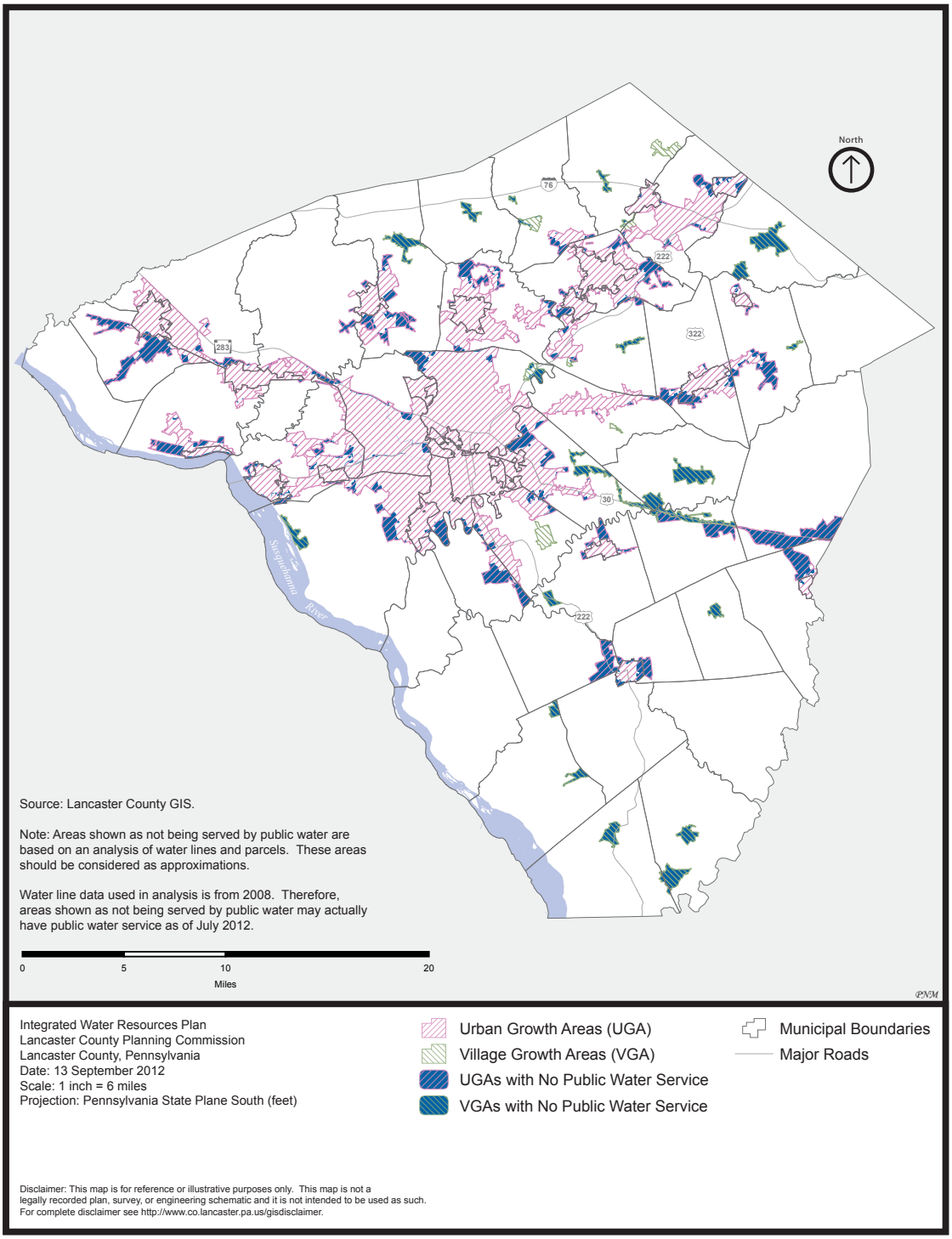


Table 4: UGA/VGA Acreage and Percent of DGA for Water and Sewer Service Areas

Designated Growth Areas (DGA)	Total Acres in DGA	*Water Service Area*		*Sewer Service Area*	
		Acres Served	% of DGA Served	Acres Served	% of DGA Served
Urban Growth Area					
CENTRAL LANCASTER COUNTY	50,459	45,230	90	45,613	90
CHRISTIANA-GAP	3,180	416	13	1,228	39
COCALICO	6,123	5,391	88	5,438	89
COLUMBIA-MARIETTA	4,009	2,960	74	2,826	70
DONEGAL	3,795	3,415	90	3,079	81
ELANCO NORTH	520	418	80	416	80
ELANCO SOUTH	3,971	2,300	58	3,202	81
ELIZABETHTOWN	6,519	4,531	70	5,571	85
EPHRATA-AKRON	8,581	6,898	80	7,197	84
LEOLA-BAREVILLE	2,015	1,883	93	1,981	98
LITITZ-WARWICK	5,910	4,915	83	5,466	92
MANHEIM	3,847	2,438	63	2,680	70
PARADISE	1,351	0	0	758	56
SOLANCO	2,549	587	23	546	21
STRASBURG	1,149	751	65	655	57
Village Growth Area					
BIRD-IN-HAND	140	0	0	136	97
BOWMANSVILLE	875	0	0	861	98
BRICKERVILLE	246	0	0	0	0
BUCK	182	0	0	0	0
CHESTNUT LEVEL	204	0	0	0	0
CLAY	302	237	78	211	70
FARMERSVILLE	189	0	0	0	0
FIVEPOINTVILLE	299	0	0	0	0
GEORGETOWN	201	0	0	192	95
GOODVILLE	74	0	0	0	0
GORDONVILLE	346	0	0	244	70
HOPELAND	52	0	0	43	84
INTERCOURSE	806	0	0	718	89
LAMPETER	493	493	100	489	99
LITTLE BRITAIN	335	0	0	0	0
MONTEREY	56	0	0	49	88
NICKEL MINES	34	0	0	0	0
NINE POINTS	55	0	0	0	0
OREGON	370	130	35	22	6
PENRYN	538	0	0	0	0
REFTON	210	0	0	0	0
REINHOLDS	413	412	100	365	88
RONKS	72	0	0	71	98
SCHOENECK	157	0	0	0	0
SMOKETOWN	201	0	0	201	100
SOUDERSBURG	141	0	0	141	100
STEVENS	166	141	85	129	78
TALMAGE	67	49	73	8	11
WAKEFIELD	399	0	0	0	0
WASHINGTON BORO	378	0	0	339	90
WITMER	111	0	0	111	100
WRIGHTSDALE	612	0	0	0	0

Source: Lancaster County GIS; 2008

the Lampeter VGA.

A study of water supply and treatment capacity was conducted to assess the ability to meet future needs in designated growth areas through 2030. The study found that there is sufficient capacity to meet future demand although further study is needed to determine whether supply and demand align geographically. Because water withdrawals are permitted by the Pennsylvania DEP and Susquehanna River Basin Commission, the impact of permitting limits must also be considered.

Stormwater Facilities

Stormwater runoff from developed areas of the County is generally managed through a system of privately and publicly owned infrastructure, including detention/retention basins, swales, culverts, inlets, gutters, pipes, roads and floodplains. More recently we have seen an increase in the use of water catchment facilities, such as cisterns and rain barrels, which help minimize stormwater runoff. Since the adoption of *Greenscapes*, there has been a greater emphasis on employing green infrastructure for its stormwater management benefits including increased evaporation and transpiration.

There is no countywide inventory of stormwater facilities; however, municipalities with Municipal Separate Storm Sewer Systems (MS4s) are required to map their outfalls. Some municipalities are mapping other stormwater management facilities including privately owned facilities.

Stormwater management facilities installed as part of an approved land development plan are generally accompanied by 1) a note on a recorded plan or 2) a recorded agreement specifying who owns and maintains the facilities. These documents are available through the Lancaster County Recorder of Deeds Office. All but the most minor of facilities are included within an easement which allows an area for the collection and discharge of water, the maintenance, repair, and reconstruction of the facilities, and the passage of machinery for work. Easements identify who has the right of access.

Existing Drainage Problems

Previous Act 167 plans prepared by the County included surveys of municipal government to identify existing drainage problems. This effort resulted in the identification of approximately 100 problem areas in the watersheds surveyed[*****]. The most common problems cited included the following: uncontrolled runoff from upstream municipalities, undersized drainage system, flooding and too large an increase in uncontrolled runoff. A complete list of problem areas identified through municipal surveys is included in **Appendix A**.

Additional stormwater problem areas were investigated in 2011 as part of a National Fish and Wildlife Foundation funded stormwater retrofit project undertaken by the Center for Watershed Protection, in partnership with the Susquehanna River Basin Commission and Lancaster County Planning Commission (*Center for Watershed Protection,* 2011). Some of the most common problems identified included eroded ditches, short-circuited stormwater basins, and connected impervious areas.

It is clear that many of the problems identified are a result of increased stormwater runoff. *Blueprints* seeks to mitigate the problem by minimizing stormwater runoff before, or in tandem with, the pursuit of grey infrastructure solutions such as replacing pipes. This approach relies heavily on the use of green infrastructure and other Low Impact Development techniques.

Release Rates

Previous Act 167 Watershed Stormwater Plans

[*****] Surveys were conducted in the Conestoga River, Little Conestoga, Cocalico, Mill and Chiques Creek watersheds.

adopted by the County of Lancaster and approved by the PA DEP included technical evaluations of the impact of stormwater runoff within the watershed. These evaluations resulted in the establishment of specific release rates for different areas within the watershed.

What is a Release Rate?

The percentage of the pre-development peak rate which may be released from a development site is known as the release rate. Release rates are generally more restrictive in the upper end of the watershed and less restrictive closer to the bottom of the watershed.

Release rates from the following previously adopted and approved Act 167 Stormwater Management Plans are incorporated herein by reference: Conestoga River Watershed (2005), Cocalico Creek Watershed (2002), Little Conestoga Creek Watershed (1997) and Mill Creek Watershed (1996).

Additional Information Required by Act 167

See **Appendix B** for additional information required by Act 167.

CHAPTER 3
Strategic Plan

Blueprints is a strategic integrated water resources plan. It provides a framework for institutional and structural changes that will ultimately lead to water quality improvement. *Blueprints* is different from other elements of the County Comprehensive Plan in several ways. First, recognizing that information about water resources is much more readily available through the World Wide Web and agencies such as the Pennsylvania DEP, Susquehanna River Basin Commission and others, the background information provided in *Blueprints* is limited to that which directly relates to the plan. Next, whereas other elements of the County Comprehensive Plan may contain close to a hundred actions, *Blueprints* contains only three strategies and fourteen actions. This approach is consistent with the strategic nature of this plan and the changing regulatory and technological environment. Finally, *Blueprints* addresses the lessons learned about implementation from past plans and provides more detailed guidance on implementing each of the recommended actions.

Implementing the strategies contained in *Blueprints* will require a great degree of collaboration. Adopting a systems thinking approach to water resources management will be helpful to those seeking to implement the plan.

What is Systems Thinking?

Systems thinking is a management approach which requires one to recognize the inter-relatedness and inherent complexity of the individual elements that make up a particular system. Systems thinking may be best exemplified by John Muir who wrote, "When we try to pick out anything by itself, we find it hitched to everything else in the universe." So it is with water resources.

Key Water Resource Challenges

The strategies contained in *Blueprints* were developed in response to specific problems and challenges identified by stakeholders during the planning process. The following statements summarize the key findings of the participants.

- Existing Municipal Comprehensive Plans and Act 537 Sewage Facilities Plans do not adequately address water resource infrastructure issues.
- A greater degree of cooperation among water/sewer service providers and municipalities is needed to ensure that water/sewer infrastructure is provided in a manner that is consistent with community goals.
- Regulatory limitations, lack of familiarity with green infrastructure based stormwater management practices and fears associated with infiltrating in karst topography have stymied progress in stormwater management.
- If Pennsylvania is not able to demonstrate significant reductions in pollutant loadings from urban, suburban and rural point and non-point sources, the likely result will be more restrictive environmental regulations which may lead to constraints on new development and increase the costs of sewer services and housing in general. More restrictive regulations will also increase development pressure in rural areas, increase farm operating costs, reduce the viability of the agricultural economy and impede the implementation of *Balance*.
- Financial resources to address water quality issues are becoming scarcer.
- Integrated water resource planning and management does not happen naturally.

Objectives and Strategies

The strategies outlined in this Chapter of *Blueprints* have been developed to achieve the following objectives:

1. Provide water, sewer and stormwater infrastructure to accommodate 85% of future growth in Urban Growth Areas.
2. Deliver essential infrastructure services to both urban and rural settlements in a cost effective manner.
3. Reduce the number of miles of impaired streams.
4. Institutionalize Integrated Water Resources Management in Lancaster County.
5. Increase the use of green infrastructure in water resources management.

The strategies described below represent the initial steps necessary to achieve these objectives. They were developed with sensitivity to current conditions, including the uncertain regulatory environment, ever increasing demands being placed on all levels of government, and the decrease in available resources due to current economic conditions.

In an attempt to advance true integrated water resources planning and management, when a particular action relates to more than one plan or program all affected plans or programs are referenced.

Strategy 1: Collaborate

Collaboration and coordination are the keys to successful implementation of integrated water resources plans. And, according to the Governor's Sustainable Infrastructure Task Force Report (2008) water resource programs can be improved and costs of delivering services can be reduced through collaboration.

Blueprints provides a framework for collaboration which focuses on increasing communication, cooperation and coordination. Enhanced collaboration will also help reduce duplication of effort and minimize the costs associated with regulatory compliance.

Why Collaborate?

There are numerous ways that water resource programs interrelate. For example, public water suppliers who rely on surface water withdrawals have a vested interest in minimizing sedimentation in streams to protect the water supply although protecting streams is not their primary mission.

Meanwhile, watershed associations whose primary mission is generally to protect and restore the waterways, struggle to secure resources and labor to implement projects such as riparian buffer planting and stream bank stabilization, both of which will help reduce sedimentation in the stream.

Likewise, MS4 permittees will be obligated under their next permit to reduce pollutants flowing from their stormwater systems by implementing actions such as tree planting, an activity being promoted by LIVE Green, a program of the Lancaster County Conservancy.

By collaborating with others, common goals can be met in a timely manner and perhaps at less cost!

Following are four specific mechanisms for collaboration that will help meet the objectives of *Blueprints*.

Establish a Forum for Communication and Collaboration

Experience has shown that the biggest obstacles to collaboration are lack of knowledge about what others are doing and failure to consider how seemingly disparate programs relate. Therefore, **the Lancaster County Planning Commission should provide a forum for key stakeholders to gather on a regular/quarterly basis for the purpose of advancing integrated water resources planning and facilitating implementation of *Blueprints*.** This may include identifying topics for education programs and workshops. The water resources forum can also serve as a platform for sharing informa-

tion about regional, state and national committees and organizations, such as the Lower Susquehanna Drinking Water Partnership being organized by SRBC and PADEP. Sub-groups should also be convened around specific issues such as source water protection, watershed restoration, green infrastructure, or stormwater when a need arises******.

The forum should include representatives from the various parts of the water resource system impacted by this plan, i.e. water/sewer authorities, municipalities, MS4 program managers, watershed associations, funders, state and regional agencies, and any others who are integral to the successful implementation of integrated water resources management.

Principal Implementer: LCPC.

Implementation Supporters: Lancaster County Conservation District; Lancaster County Conservancy; Lancaster County Clean Water Consortium; and Pennsylvania Rural Water Association.

Timeframe: Short-term

✔ The first forum should be held within 6 months of adoption.

Related water resource issues: water quality, infrastructure, stormwater.

Establish a Peer Network for Stormwater Professionals

Prescriptive ordinances and a low tolerance for risk among reviewers are major impediments to the use of more innovative stormwater management BMPs. *Blueprints* addresses the issue of prescriptive ordinances by eliminating most design criteria from the *Model Stormwater Ordinance* provided within this plan and instead relying on performance standards. See **Chapter 6 Tools and Resources** for more information about the Model Ordinance including a summary of the minimum performance standards.

Recognizing that this may result in increased challenges for reviewers, ***Blueprints* recommends the formation of a peer network for those involved in stormwater design and plan review.** The primary purpose of the Peer Network would be to help reviewers gain a higher degree of comfort with new or innovative stormwater management practices by providing the reviewer with an opportunity to seek input from other professionals who have experience with the particular practice or approach being proposed.

Operation of the network could be a function of an existing institution or organization, such as the Lancaster County Conservation District, Lancaster County Clean Water Consortium, a professional society, or other.

The Peer Network should be comprised of individuals possessing experience with a broad range of stormwater management BMPs who are willing and able to devote time to helping others gain experience with assorted BMPs. Participants in the Network should be familiar

****** Pennsylvania Rural Water Association has indicated that there is an immediate need to bring Lancaster County communities with Source Water Protection plans together to pursue common goals, such as community education.

A Note about Timeframes

The timeframes referenced in *Blueprints* are consistent with the strategic nature of the plan. The timeframes were established to coincide with implementation of Pennsylvania's Chesapeake Bay Watershed Implementation Plan (PA WIP). See Chapter 5 for additional information on the PA WIP.

***Short-term* = actions that should be undertaken within the next 18 months**

***Mid-term* = actions that should be undertaken within the next 3 years**

***Long-term* = actions that should be undertaken by 2017**

with the stormwater management (Act 167) components of *Blueprints*. Specific guidelines for the operation of the Peer Network will be developed by the entity housing the Network, with input from stakeholders. The LCPC will assist in developing the guidelines as needed.

Principal Implementer: LCPC.

Implementation Supporters: Lancaster County Conservation District; Lancaster County Clean Water Consortium Stormwater Committee; Lancaster County Conservancy; Municipal engineers and other stormwater professionals.

Timeframe: Short-term

✔ Within six months of the adoption of *Blueprints*, an entity will be identified to host a Peer Network for stormwater professionals.

Related water resource issues: stormwater, water quality, source water protection.

Pursue Regional Management Structures

Regulatory obligations associated with water resource management have increased over the last several years, particularly for the forty-three municipalities subject to Municipal Separate Storm Sewer System (MS4s) permit requirements. In addition, each municipality in the county must review post-construction stormwater management plans, operate and maintain publicly owned stormwater infrastructure, conduct inspections of stormwater and erosion and sedimentation control facilities during construction, and periodically inspect permanent stormwater facilities to ensure that they are functioning as designed. While water services do not necessarily require the same breadth of services, many have source water protection plans that call for education and other activities that could be conducted more cost effectively through collaboration.

Collaborating to address water, wastewater and stormwater management obligations will reduce costs while increasing the effectiveness of programs. Therefore, **municipalities and authorities should work together to achieve program goals.** This may include creating regional management structures, utilizing existing structures such as the Lancaster Inter-Municipal Committee (a Council of Governments or COG), or using another mechanism for collaboration such as a shared municipal services agreement.

Many municipalities are already participating in a regional wastewater system, such as the Lancaster Area Sewer Authority or Ephrata Borough Authority, to address wastewater needs in Designated Growth Areas. As communities begin to explore different options for addressing failing on-lot systems in rural areas, regional management of decentralized community wastewater systems in rural areas should be explored.

Principal Implementer: MS4 Permittees; Water/Sewer Service Providers.

Supporters/Assistants: Lancaster Inter-Municipal Committee; PADEP; Lancaster County Planning Commission; Lancaster County Conservation District.

What is an MS4?

MS4 stands for municipal separate storm sewer system. All separate storm sewers that are defined as "large" or "medium" or "small" municipal separate storm sewer systems pursuant to 40 CFR §§ 122.26(b)(18), or designated as regulated under 40 CFR § 122.26(a)(1)(v), are subject to permitting by the PADEP. MS4 permit obligations include instituting six minimum control measures as mandated by the National Pollutant Discharge Elimination System (NPDES) MS4 program. MS4 permittees will also have to prepare a Chesapeake Bay Pollutant Reduction Plan in accordance with recent changes to the state MS4 program and some are required to prepare an MS4 TMDL Plan.

Timeframe: Mid-term

✔ Within two years of the adoption of *Blueprints* the number of communities working together to meet program requirements will increase.

Related water resource issues: water quality, infrastructure, source water protection.

Related Planning Programs: Act 167, Act 247, Source Water Protection, Act 537.

Pursue Local Nutrient Credit Trades

Pennsylvania's Nutrient Credit Trading Program is a market-based program that provides incentives for entities to create nutrient reduction credits by going beyond statutory, regulatory or voluntary obligations to remove nutrients (reduce pollutants) from a watershed. The credits can be traded to help others meet their obligations more cost effectively. According to the PADEP web site, "the primary purpose of the Nutrient Credit Trading Program is to provide for more efficient ways for National Pollutant Discharge Elimination System (NPDES) permittees to meet their effluent limits for nutrients." Using nutrient credits that are generated within Lancaster County will help reduce the county's overall nutrient load while also providing additional benefits associated with such BMPs as Riparian Buffers and Streambank Stabilization.

Nutrient Credit Trading Program

The Lancaster Farmland Trust in consort with the Lancaster County Agricultural Preservation Board received a grant from NFWF in 2009 to establish a nutrient credit trading program specifically for preserved farms. Nutrient credits are generated by farms that have implemented BMPs that reduce nutrient and sediment runoff into waterways. Any improvements that go above and beyond the standard "baseline" generate credits which can then be sold or traded. Any credits must be verified and registered by the PADEP before being eligible for trading. For more information please contact the Lancaster Farmland Trust.

To date, all but one of the significant point source sewage dischargers (>.4 MGD design annual average daily flow as of August 2005) in Lancaster County have opted to upgrade their systems to meet permit limits rather than purchase credits. However, as smaller wastewater treatment plants are required to renew their permits they will also need to meet lower nutrient limits. And, new sources, such as small package plants, will also need to meet zero nutrient load limits. **When nutrient credits are being used to meet permit limits, preference should be given to purchasing locally generated credits.**

To ensure that locally generated credits are used to meet permit requirements, the LCPC will convene a workgroup to develop guidance for both credit users and generators. The Water Resources Forum may be a vehicle for connecting generators and users.

Evaluations of nutrient credit trading options conducted as part of the Act 537 Sewage Facilities Planning process should identify and evaluate opportunities to purchase locally generated credits. When comparing pricing of credits to other wastewater management options, consideration should be given to other benefits offered by the activity such as source water protection.

Principal Implementer: LCPC.

Implementation Supporters: Lancaster Farmland Trust; Lancaster County Conservation District; Lancaster County Conservancy; Wastewater Authorities; Watershed Associations; PADEP; PENNVEST.

Timeframe: Mid-term

✔ Develop guidance and begin promoting to municipalities and operators of small systems within two years of adoption of *Blueprints*.

Related water resource issues: water quality, infrastructure, source water protection

Related planning programs: MS4 Chesapeake Bay Pollutant Reduction Plan, MS4 TMDL Plan, Act 537, Act 247

Support Conservation District "Plan for Every Farm" Program

The proper implementation of conservation practices on farms is critical to protecting and restoring streams and aquifers. Currently, all farms are required to have an up-to-date conservation plan and to implement that plan; however, according to the Lancaster County Conservation District (District), many farms still lack such plans. The District has set a goal of having an Erosion and Sediment Control Plan (E&S Plan or Conservation Plan), and manure management plan when applicable, on every farm in Lancaster County by 2015.

The Lancaster County Planning Commission and local municipalities should work together with the Lancaster County Conservation District to ensure that there is a plan for every farm in Lancaster County by 2015.

By conditioning certain local permits on the submission of a Conservation Plan, municipalities can help advance this effort and ensure that such plans are being implemented. This approach, which was piloted in Warwick Township, resulted in all farms in the township having a conservation plan as of early 2012.

Principal Implementer: Municipalities.

Implementation Supporters: LCPC; Lancaster County Conservation District.

Timeframe: Short-term

✔ Upon adoption of *Blueprints*, municipalities, with assistance from LCPC staff if needed, will support the District's goal of having a plan on every farm by conditioning certain local permits on the submission of a Conservation Plan.

Related water resource issues: source water protection.

Related planning programs: Act 247, MS4 Chesapeake Bay Pollutant Reduction Plan, MS4 TMDL Plan.

Strategy 2: Accelerate Implementation of Existing Plans

While there are many plans, studies and strategies that indicate what needs to be done to protect, conserve, and restore the water resources of Lancaster County, implementation has been slow. The most common response to the question of why, is lack of resources. However, resources are being invested in community development projects, transportation projects, neighborhood improvement projects and others, most of which have some water resource connection.

Other common reasons given for why plans aren't being implemented are uncertainty about who is responsible for implementation and lack of capacity to manage projects. While all of these are valid reasons, in some cases it is simply an oversight.

The following steps should be taken to accelerate implementation of existing plans using available tools and resources:

1. Local ordinances should be amended (or adopted) to incorporate better water quality protection measures.
2. Funding criteria should be revised to ensure alignment with adopted policy

and planning goals.

3. Water quality improvement measures should be built into capital and maintenance projects.

Amend/Adopt Local Ordinances

Zoning, subdivision and land development (SALDO), stormwater and floodplain management ordinances are the key tools used to minimize stormwater runoff and regulate development in a way that protects water resources. Pennsylvania's Storm Water Management Act (Act 167) requires all municipalities in Lancaster County to adopt or amend ordinances that regulate development in a manner consistent with the County's Act 167 Plan within six months of its adoption and approval by Pennsylvania's Department of Environmental Protection (PADEP).

Most municipalities comply with this requirement by simply adopting a stormwater management ordinance. However, the stormwater management ordinance isn't the only tool that can be used for this purpose. Municipalities are encouraged to incorporate water quality protection measures into other regulating documents including the Zoning Ordinance, SALDO and other regulations. Municipalities may need to amend property maintenance regulations, sometimes referred to as "weed control" ordinances, to ensure that beneficial practices, such as meadows, aren't prohibited.

Blueprints includes several tools to assist municipalities with amending and adopting ordinances, including:

- *A Model Stormwater Management Ordinance* developed in accordance with the procedures outlined in PA Act 167;
- *A Model Conservation Zoning District;* and
- *Natural Resource Protection Standards.*

A vast array of other publications, such as the Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships, and Lancaster County, Pennsylvania, also known as the "Builders for the Bay" document, are available to guide municipalities in developing regulations that are consistent with the goal of *Blueprints*. Additional information about Tools and Resources is provided in **Chapter 6**.

Principal Implementer: Municipalities.

Implementation Support: LCPC; PADEP; LIMC and other Councils of Government; Peer Network for Stormwater Professionals.

Timeframe: Short-term

✔ Within six months following adoption and PADEP approval of *Blueprints*, each municipality shall adopt or amend and shall implement a stormwater management ordinance or other regulations as are necessary to regulate development in a manner consistent with *Blueprints* and the provisions of Act 167, (Section 11(b) of Act 167).

Timeframe: Mid-term

✔ Within two years of adoption of *Blueprints* municipalities are encouraged to amend or adopt zoning, SALDO, street ordinances, etc. to address natural resource protection, minimize stormwater runoff and otherwise protect water resources.

Related water resource issues: water quantity, water quality, stormwater.

Related planning programs: Act 167, Act 247.

Pursue Water Quality Improvements through Existing Sources of Funds

Another way to accelerate implementation of existing plans is to pursue water quality improvements through existing sources of funds. There are two primary ways this can be accomplished:

1. Amend funding programs to ensure alignment with adopted policy and planning goals; and
2. Incorporate water quality improvements into existing capital or maintenance projects.

Align Funding Criteria

Public funds are often invested without consideration of the water quality impacts of the project. Given the need to clean up local streams and reduce pollutants to meet the Chesapeake Bay TMDL, public dollars can no longer be invested in ways that exacerbate, or do little to nothing to mitigate, other known or associated problems. When investing public funds, the benefits derived from every dollar invested must be maximized.

LCHRA – Aligning Funding to Meet Multiple Goals

In 2012, the Lancaster County Housing and Redevelopment Authorities invited LCPC staff to participate in pre-application meetings with Community Development Block Grant applicants to ensure the applicants were familiar with the policies, goals and objectives of the County Comprehensive Plan. The meetings tended to focus on the many benefits of incorporating green infrastructure into proposed neighborhood improvement projects. For example, adding street trees to a project that originally included only sidewalks, curbs and roadway, and drainage improvements can help meet MS4 permit requirements to reduce pollutant loads associated with stormwater runoff, increase home values, help cool the neighborhood and ensure a greater degree of consistency with the County Comprehensive Plan.

Therefore, **a thorough review of funding programs under the control of or subject to criteria established by the county should be conducted to identify opportunities to align funding programs consistent with the goal and objectives of *Blueprints.*** Programs to be reviewed include but should not be limited to: Transportation Enhancements Program, Smart Growth Transportation Program, Municipal Transportation Grant Program, Urban Enhancement Fund, Natural Lands Preservation Fund, and Lancaster County Agricultural Conservation Easement Program. In some cases appropriate criteria already exists but is not being considered and in other cases, criteria will need to be developed or funding programs amended to allow for and/or to accommodate consideration of water resource issues. The local administrative policies governing requests for Community Development Block Grant funds should also be reviewed and revised to reflect the policies and priorities in *Blueprints*.

Principal Implementer: Board of County Commissioners; Lancaster County Housing and Redevelopment Authorities; Lancaster County Transportation Coordinating Committee; Lancaster County Agricultural Preserve Board.

Implementation Support: LCPC.

Timeframe: Short-term

✔ Within eighteen (18) months of the adoption of *Blueprints*, funding criteria will have been reviewed and amended, as needed.

Related water resource issues: water quantity, water quality, infrastructure.

Amend Capital Projects and Maintenance Programs

To make the best use of available resources, opportunities to incorporate watershed protection and restoration into capital projects and maintenance activities must be considered. Amending planned capital improvement projects, including those on the Transportation Improvement Program (TIP), to incorporate practices that reduce runoff and improve water quality will stretch the limited dollars available and maximize the benefits realized from every dollar invested. Likewise, many maintenance activities, such as street reconstruction, could also incorporate

What is the TIP?

The Transportation Improvement Program (TIP) is a regional list of transportation projects slated for funding. Many of these projects could incorporate better water quality and stormwater provisions. The TIP is created by the Lancaster County Transportation Coordinating Committee (Lancaster County's Metropolitan Planning Organization or "MPO").

measures that will benefit water resources.

Opportunities and/or needs for watershed protection and restoration projects are identified in watershed implementation plans, Source Water Protection plans, stormwater management plans, Act 537 Sewage Facilities Plans, river conservation plans, comprehensive plans, and transportation plans. **Chapter 5** includes information about many of these existing plans.

Principal Implementer: Municipalities; Lancaster County Transportation Coordinating Committee.

Implementation Support: LCPC.

City of Lancaster Green Infrastructure Implementation Project

Sixth Ward Park in the City of Lancaster is an example of a happy marriage of two plans: the City's Urban Park, Recreation and Open Space Plan (UPROS) completed in 2009 and its Green Infrastructure (GI) Plan completed in 2011. The UPROS Plan focused on improving park amenities like basketball courts, play equipment, picnic areas, restroom facilities and water features. The GI Plan focused on how to use parks to manage stormwater from adjacent streets and buildings. So when the plan for the park included a new basketball court, the City began looking at building a porous play surface with an infiltration bed of stone underneath to manage stormwater from Ross and Reservoir Streets. The result: a basketball court that never gathers puddles, is quieter, and manages some 700,000 gallons of stormwater annually that would otherwise flow into the combined sewer system.

Timeframe: Short-term

✔ Within one year of the adoption of *Blueprints*:

- All municipalities will have evaluated their capital and maintenance projects and determined how they can incorporate water quality improvements. Those with a Capital Improvement Plan (CIP) will amend their CIP accordingly.
- The Lancaster County Transportation Coordinating Committee (Lancaster County's officially designated Metropolitan Planning Organization) will modify the Transportation Improvement Plan to incorporate measures to protect or improve water quality. These would be considered "betterments" according to the TIP Modification Procedures.

Related water resource issues: water quantity, water quality, infrastructure, stormwater.

Related planning programs: Act 167, Act 247, Source Water Protection.

Strategy 3: Improve Planning and Design

Although there are many plans that address water resources, including comprehensive plans, sewage facilities plans, Source Water Protection plans, and others, they have proven insufficient when it comes to protecting, conserving and restoring water resources in Lancaster County. Therefore, *Blueprints* outlines specific ways that planning can be improved to meet the desired objectives.

Improved planning is needed in the following areas:

1. Comprehensive watershed management
2. Water and sewer infrastructure
3. Rural wastewater management

What is a Hydrologic Unit Code (HUC)?

The USGS has developed a system for categorizing drainage basins called the Hydrologic Unit Code. This system divides the U.S. into successfully smaller areas: regions (largest), sub-regions, accounting units, and cataloging units (smallest).

The first level (HUC-02)divides the US in 21 regions, based either on a major river watershed or the drainage area of a network of rivers. The second level (HUC-04) divides the 21 regions into 221 sub-regions based on the reach of a river and its tributaries. The third level (HUC-06) categorizes the sub-regions into accounting units or basins. The cataloging units level (HUC-08) represent a part of a drainage basin (sub-basin), a combination of drainage basins, or a distinct hydrologic feature. A 5th and 6th level were added more recently (HUC-10 and HUC-12).

When being discussed, the hydrologic unit code appears as "HUC" followed by the number of digits: two digits per level. For example, 020503060904 is referred to as the HUC-12 watershed.

Level Name	HUC Code	Description
Region (HUC-02)	02	Mid Atlantic
Subregion (HUC-04)	0205	Susquehanna
Basin (HUC-06)	020503	Lower Susquehanna
Subbasin (HUC-08)	02050306	Lower Susquehanna
Watershed (HUC-10)	0205030609	Cocalico Creek
Subwatershed (HUC-12)	020503060904	Cocalico Creek-Conestoga River

Source: USDA, Natural Resources Conservation Service

4. Stormwater management
5. Green infrastructure

The holistic, or integrated water resources planning approach advocated in *Blueprints*, will help ensure that communities are realizing the maximum benefits from their efforts.

Planning Scale

One thing is clear – water does not recognize municipal boundaries. Therefore, watershed boundaries must be considered in all future planning efforts.

The appropriate geographic scale for planning will vary depending on the water resource issue being addressed and the goal or goals of the planning effort. The following is offered as general guidance for determining the appropriate geographic scale for water resources planning:

Plan	Recommended Geographic Scale
Comprehensive Plan	Chesapeake Bay to HUC 12 Watershed
W/S Infrastructure	HUC 12 Watershed
Rural Wastewater	HUC 12 Watershed
Regional Stormwater	HUC 12 Watershed or Smaller
Green Infrastructure	HUC 10 - HUC 12 Watershed

Comprehensive Planning

In accordance with the Municipalities Planning Code, municipal and regional comprehensive plans generally include a section describing a community's water and sewer infrastructure, as well as sections related to natural features, e.g. geology, soils, watersheds, stream quality, etc. Rarely are the water resources components of a comprehensive plan developed in a way that provides meaningful insight about the municipality's role or function within a watershed. **Municipal and multi-municipal comprehensive plans should place a greater emphasis on the municipality's placement within and relationship to the watershed, particularly as it relates to the need to improve water quality.** A watershed orientation should be reflected in all future comprehensive plans.

Water, Sewer and Stormwater Infrastructure

Public water, sewer and stormwater infrastructure is essential to accommodating the growth anticipated in designated Urban Growth Areas throughout the county[*******]. Just as the lack of public infrastructure can result in patterns of growth that are inconsistent with urban growth

******* Currently projected at 79,522 additional residents by 2030. See **Chapter 2** for more on population demographics.

MPC Supports Sustainable Infrastructure

Article XI of the MPC provides the authority for municipalities and authorities to enter into Intergovernmental Cooperative Planning and Implementation Agreements to ensure that (1) new public water and wastewater treatment systems are constructed in areas that will result in the efficient utilization of existing systems, prior to the development and construction of new systems and (2) to ensure that new or major extension of existing public water and wastewater treatment systems are constructed only in those areas within which anticipated growth and development can adequately be sustained within the financial and environmental resources of the area *(MPC, Section 1101.(8) and (9)).*

management strategies, the improper placement of infrastructure can lead to unchecked growth that places the county's farmland and natural areas at risk. Maintenance of existing infrastructure, both public and private, is also vital to realizing growth management goals.

As noted in **Chapter 2**, there are many areas that have been designated as Urban Growth Areas, but which lack adequate infrastructure; failing on-lot disposal systems are not adequately addressed in Act 537 Sewage Facilities Plans; and stormwater management facilities are unattractive and consume too much valuable land. Therefore, the following steps should be taken to improve infrastructure planning:

1. Municipalities and water/sewer service providers should develop a plan to ensure that infrastructure is available to accommodate 85% of future growth in UGAs. Plans should provide predictability about where and when service will be available, the estimated cost of service and how services will be paid for.
2. Municipalities and water/sewer service providers should take appropriate steps to align water/sewer service area boundaries and DGA boundaries.
3. Municipalities should ensure appropriate wastewater management is provided in rural areas.
4. Conduct regional stormwater management planning.
5. Develop stormwater BMP demonstration sites.

Plan to Fully Serve Urban Growth Areas

Despite the Municipalities Planning Code (MPC) requirement that a comprehensive plan shall include a plan for community facilities and utilities[********], the water/sewer facilities component of many comprehensive plans falls short of providing a long-term plan for fully serving designated growth areas. The plans may contain a statement of policy about where service is to be provided, or not, but most do little beyond that.

Municipal comprehensive plans should include a goal and strategy to fully service designated growth areas by a certain date. The plan should provide some level of predictability about where and when water/sewer service will be provided, and describe who is responsible for developing the service and how it will be paid for. An enhanced water and sewer planning process should also result in service areas that are consistent with designated growth area boundaries.

This action should be implemented in the context of a comprehensive plan update or amendment. Following the comprehensive plan update or amendment, all other plans that have been adopted by the local governing body, including the 537 Sewage Facilities Plan, should be reviewed and updated as necessary to ensure consistency with the most recently adopted comprehensive plan. Pennsylvania DEP and SRBC cooperation will be critical to ensure that water withdrawal permits are structured to support this effort.

Principal Implementer: Municipalities and

[********] Pennsylvania Municipalities Planning Code, Section 301(a)(4).

Water/Sewer Service Providers (Authorities).

Implementation Supporters: Municipal Engineers; Comprehensive Plan Steering Committee; Regional planning committees; Council of Governments; LCPC Staff; SRBC; and PADEP.

Timeframe: Short to Mid-term

- ✔ All municipal and multi-municipal comprehensive plans adopted subsequent to the adoption of *Blueprints* shall include a goal and strategy to fully service urban growth areas.
- ✔ Within two years of adopting a municipal or multi-municipal comprehensive plan each municipality should review and update, as necessary, all other plans adopted by the local governing body, including the Act 537 Sewage Facilities Plan.

Related water resource issues: water quantity, water quality.

Related planning programs: Act 247, Act 537.

Align Water and Sewer Service Areas with DGAs

The provision of public water and/or sewer service outside DGAs can stimulate or encourage growth where growth is not wanted just as the lack of services may result in development that is inconsistent with county and municipal comprehensive plans, i.e. large lot development with on-lot disposal and individual on-site water wells in Urban Growth Areas.

Therefore, the county and most municipalities, through their respective comprehensive plans, have indicated the desire to restrict public water and sewer service to Designated Growth Areas except in those situations where the provision of public water and/or sewer is necessary to protect public health. Nevertheless, some public water and sewer services and/or service areas extend beyond Designated Growth Area (DGA) boundaries.

To address inconsistency between designated growth area boundaries and water and sewer service areas, those **municipalities who have recently adopted a comprehensive plan should work with water/sewer service providers to align water and sewer service area boundaries and designated growth area boundaries.** In some cases this may require approval from the Pennsylvania Public Utilities Commission.

If there is not a plan to fully service the Urban Growth Area, a plan for doing so should also be established as described above. The comprehensive plan and other relevant plans, including the 537 Sewage Facilities Plan should be amended to ensure consistency among planning documents.

An Intergovernmental Cooperative Planning and Implementation Agreements can be used to ensure that new or major extension of existing public water and wastewater treatment systems are constructed only in those areas within which anticipated growth and development can adequately be sustained within the financial and environmental resources of the area (MPC, Section 1101.(8) and (9)).

Principal Implementer: Municipalities and Water/Sewer Service Providers (Authorities).

Implementation Support: Pennsylvania Public Utility Commission (PUC); LCPC Staff.

Timeframe: Short-term to Mid-term

- ✔ Municipalities who do not intend to update their comprehensive plans or review their Designated Growth Areas within the next two years shall develop a strategy for fully serving Urban Growth Areas and aligning water/sewer service area boundaries.
- ✔ Within two (2) years of developing a strategy for fully serving UGAs, municipalities will amend their Comprehensive Plan and Act 537 plan to

What is the *Wastewater Strategies for Rural Areas* tool?

This tool provides a wastewater evaluation process that can be used by municipalities and developers to evaluate feasible, environmentally sound wastewater management alternatives to large public systems that will meet the goals of the county and local comprehensive plans. It was developed to assist municipalities with identifying appropriate wastewater management strategies for rural areas, particularly rural centers and identified Needs Areas, and to assist municipalities undertaking a somewhat abbreviated sewage facilities planning process. See **Chapter 6** for additional information on this and other tools and resources.

reflect the alignment of water/sewer service areas and designated growth areas.

Related water resource issues: water quantity, water quality.

Related planning programs: Act 247, Act 537.

Plan for Appropriate Wastewater Management in Rural Areas

Cost effective, technically feasible, and environmentally sound wastewater management options that are consistent with the policies and goals of county and local comprehensive plans are needed to ensure implementation of the growth management strategies outlined in *Balance.*

Unfortunately, Act 537 Sewage Facilities Plans rarely include sufficient guidance for municipalities with failing OLDS (on-lot disposal systems) outside of designated growth areas, where extending public sewer service may incentivize unwanted growth. In order to protect water supply sources and ensure the sustainability of existing rural development, **municipalities should undertake rural wastewater management planning through either the comprehensive planning process[********], Act 537 Sewage Facilities Plan or as a stand-alone planning effort.**

The Wastewater Strategies for Rural Areas tool, available through the LCPC's web-based Smart Growth Toolbox and further described in **Chapter 6**, can be used to better plan for appropriate wastewater management in rural areas. The Lot-Size Viewer, which is part of the Wastewater Strategies for Rural Areas tool, can help municipalities determine the potential extent of the problem. Areas with a high concentration of small lots and older buildings should be a priority for this planning effort.

Principal Implementer: Municipalities.

Implementation Support: Municipal/Regional Authorities; PADEP; LCPC staff.

Timeframe: Short-term

- ✔ All municipal and regional comprehensive plans adopted subsequent to the adoption of *Blueprints* shall include a goal and strategy to address rural wastewater management needs and protect water supplies.
- ✔ Within one year of the adoption of *Blueprints*, municipalities which do not have a current Act 537 Sewage Facilities Plan (approved within the last 10 years) will have initiated an evaluation of potential wastewater management problem areas in rural areas and identified areas which are a priority for rural wastewater planning.

Timeframe: Mid-term

- ✔ Within three years of the adoption of *Blueprints*, municipalities with identified Needs Areas (potential or immediate) outside urban growth areas (UGA) should (1) undertake a thorough and unbiased evaluation of alternatives for addressing

[********] The Pennsylvania Municipalities Planning Code (MPC) section 301.b states that a comprehensive plan shall include a plan for the reliable supply of water… including provisions adequate to protect water supply sources.

failing on-lot systems and (2) show progress towards implementation of the selected alternative.

Related water resource issues: water quality.

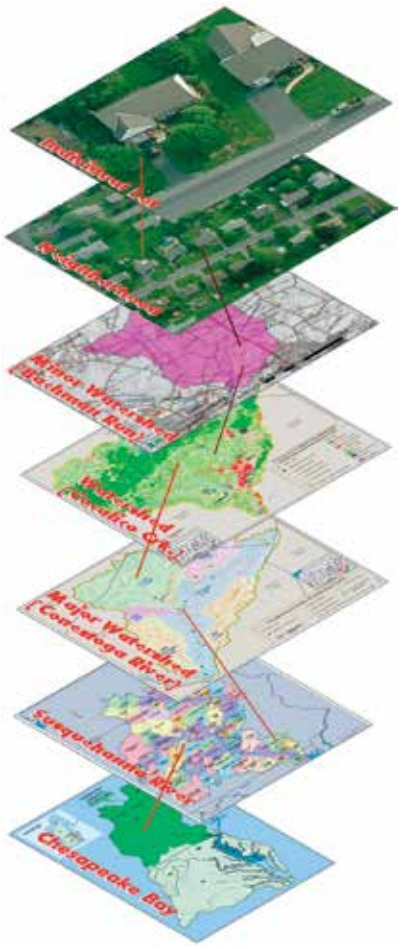
Related planning programs: Act 247, Act 537, Source Water Protection.

Conduct Regional Stormwater Management Planning

In order to achieve the densities called for in *Balance*, stormwater management, particularly for volume and peak rate, may be accomplished off-site while water quality requirements are met on-site. This approach, which acknowledges that stormwater is a resource and stormwater facilities are part of a community's infrastructure system, is best accomplished by planning for stormwater management at the HUC-12 or smaller scale. See the accompanying diagram, which further describes the different levels of stormwater planning.

Regional stormwater management planning allows for stormwater to be managed in ways

Regional Stormwater Planning



Examples		
Responsibility	*Quantity/Quality*	*Conveyance*
Individual/ Municipality	Stream Buffers, Rain Gardens, Green Roofs, Pervious Paving, and other BMPs	Roadside Gutters, Driveway Culverts, Yard Grading
Municipality	Detention/Retention/ Infiltration Basins, Large Regional BMPs*	Roadside Gutters, Pipe/Inlet Systems, Swales
Municipality/ County	Regional Detention, SWM Authorities, Stream Fencing/Restoration*	Small Bridges, Large Culverts, Large Swales, Natural Watercourses (Streams)
County/State	State Project (Middle Creek, Speedwell), Creek Fencing/Restoration R/M Low Head Dams*	Moderate to Large Bridges, Natural Watercourses (Creeks)
State/S.R.B.C./ U.S.A.C.E.	Large Flood Control (Raystown, Cunrensville), Sediment Stored Behind Large Hydrolectric Dams*	Large Bridges, Natural Watercourses (Rivers)
C.B.F./ U.S. EPA/ U.S.A.C.E.	Multi-State Projects and Initiatives, Chesapeake Bay TMDL*	Not Applicable

* These categories included TMDLs and the cumulative effects of BMPs, and detention/retention/ infiltration facilities

that take into account Critical Aquifer Recharge Areas (CARA) and other environmental features such as floodplains and riparian corridors. Removing legacy sediment may be an effective regional stormwater management strategy to restore the floodplain's function. Other goals such as habitat restoration and urban greening can also be achieved through a regional approach to stormwater management. Green infrastructure approaches are integral to regional stormwater plans.

Municipal or multi-municipal regional stormwater management plans should be prepared to accomplish the following goals for effective regional stormwater management:

- Integrate various stormwater management options to adequately address runoff generated by past, present, and future land development practices.
- Connect land use and stormwater management, especially in comprehensive planning.
- Treat stormwater as a resource.
- Utilize appropriate practices at different geographic levels.
- Provide stormwater management to accommodate increases in imperviousness in UGAs.

Other planning specific goals should be defined at the outset of the planning effort, e.g. to create additional storage in a floodplain, to accommodate infill or redevelopment, to correct an existing problem area, etc. When possible, the regional stormwater management plan should coincide with the establishment of tree canopy targets. See **Chapter 6** for tools and resources to assist with this activity.

Principal Implementer: Municipalities.

Implementation Support: Municipal/Regional Authorities; Private design and engineering firms; PADEP; Lancaster County Conservation District; LCPC; Lancaster County Conservancy

Timeframe: Mid to Long-term

✔ Each municipality with a Designated Growth Area will have participated in at least one regional stormwater management planning effort by 2017.

Related water resource issues: water quantity, water quality, infrastructure.

Related planning programs: Act 247, Act 537.

Develop Stormwater BMP Demonstration Sites

Incentives are needed to encourage the use of stormwater management practices that result in infiltration and transpiration, are properly constructed and that demonstrate creativity in design. Although there are many ways to incentivize better stormwater management, ***Blueprints* recommends the development of stormwater BMP demonstration projects** to increase awareness of and educate key stakeholders about better stormwater management practices.

The Warwick Municipal Campus has served as a demonstration site for the past several years. Best management practices utilized at

Moving Stormwater Forward in Lancaster County

In 2010 the Center for Watershed Protection, Lancaster County Planning Commission and Susquehanna River Basin Commission received a National Fish and Wildlife Foundation Chesapeake Bay Small Watershed Grant to conduct stormwater retrofit assessments and construct a stormwater BMP demonstration project. Approximately forty people, including municipal staff, elected officials, consultants and county staff were trained and participated in the field assessments to identify retrofit opportunities. The assessments resulted in the identification of forty potential retrofit projects ranging in cost from $120 to $176,000.

the site include porous concrete walkways, pervious parking with infiltration beds, and a bio-basin. Having similar demonstration sites in other areas of the county for municipal officials, designers, developers and property owners to visit will help increase the awareness of these practices.

One demonstration project is being built in Froelich Park (Mountville Borough) as part of a project called "Moving Stormwater Forward in Lancaster County." See sidebar for additional information on this project. Approximately forty additional projects have been identified and should be pursued as funding becomes available. It is likely that projects have already been built which could also serve as demonstration sites. These sites should be identified and promoted as stormwater BMP demonstration sites.

Principal Implementer: LCPC.

Implementation Support: LIMC; Lancaster County Conservation District; Peer Network; Municipalities; Watershed Organizations; Lancaster County Clean Water Consortium.

Timeframe: Short-term

- ✔ Within six months of adoption of *Blueprints*, the LCPC will provide each municipality with a list of potential stormwater projects in their municipality as identified by the Center for Watershed Protection.
- ✔ Within eighteen (18) months of the adoption of *Blueprints*, there will be at least one stormwater BMP demonstration site identified in each of the six LCPC regions.

Related water resource issues: water quantity, water quality, infrastructure, stormwater.

Related planning programs: Act 167, Source Water Protection.

Green Infrastructure Planning

Green infrastructure helps to protect, enhance, and restore the natural functions and services of an ecosystem. These ecosystem services include cleaning the air, filtering and cooling water, recycling nutrients, pollinating crops, regulating climate, capturing and storing excess carbon in the atmosphere, reducing storm and flood damage, and maintaining groundwater aquifers.

While *Greenscapes* (2009) recommends increasing green infrastructure for its many ecological functions, *Blueprints* focuses on increasing tree canopy specifically because of the many functions trees provide within the water resource system; particularly as it relates to stormwater management and stream water quality.

How Trees Assist Stormwater Management

Pennsylvania's 17 million acres of forest give the Commonwealth a beauty arguably unmatched by any other state. Besides providing aesthetic charm, wildlife habitat, and a means for keeping home cooling costs low, trees also provide a cost-effective, multifaceted way to manage stormwater.

Through the process of evapotranspiration, trees move water collected from its roots to its canopy where it is released as water vapor back into the atmosphere. This process is an inherent part of the water cycle. A single mature oak tree can transpire 40,000 gallons of water per year.

The ability of trees to reduce stormwater runoff may be its most overlooked attribute. By intercepting rain with its canopy before it reaches the ground, trees reduce the volume of stormwater runoff. Generally speaking, a deciduous tree can intercept between 500 and 750 gallons of water a year and a full-grown evergreen tree can intercept well over 4,000 gallons a year. Trees also increase infiltration of stormwater. According to a researchers from Virginia Tech, Cornell University and the University of California at Davis, the roots of both black oak and red maple trees penetrated compacted clay loam soil, increasing infiltration rates by an average of 153%.

Set Tree Canopy Targets

Trees are a vital part of any green infrastructure system. A proactive approach to increasing tree canopy involves setting specific targets, developing plans to achieve those targets and implementing those plans. Therefore, **a countywide target and action plan to increase tree canopy should be developed.**

By establishing local tree canopy targets, communities will gain a better understanding of where resources should be directed to achieve the greatest benefit. Communities that set tree canopy targets and develop plans to increase tree canopy may have a better chance of securing funding for tree planting as it becomes available through programs such as Pa DCNR's Tree Vitalize program. Therefore, **local targets and action plans should be established as well.**

Many communities already have tree planting programs, such as local Shade Tree Commissions. A survey of local municipalities and nonprofits found that 10,924 trees will be planted in 2013 which will result in 113.5 acres of additional tree canopy. This will serve as a minimum annual target for tree planting until a countywide long range target is established by the LCPC.

Table 5: The Cost of Low Impact Development (LID) vs. Conventional Development

Project	*Conventional Development Cost*	*LID Cost*	*Cost Difference*	*Percent Difference **
2nd Avenue SEA Street, Seattle, WA	$868,803	$651,548	– $217,255	– 25%
Auburn Hills, Southwestern WI	$2,360,385	$1,598,989	– $761,396	– 32%
Bellingham City Hall, Bellingham, WA	$27,600	$5,600	– $22,000	– 80%
Bellingham Bloedel Donovan Park, Bellingham, WA	$52,800	$12,800	– $40,000	– 76%
Gap Creek, Sherwood, AR	$4,620,600	$3,942,100	– $678,500	– 15%
Garden Valley, Pierce County, WA	$324,400	$260,700	– $63,700	– 20%
Kenslington Estates, Pierce County, WA	$765,700	$1,502,900	+ $737,200	+ 96%
Laurel Springs, Jackson, WI	$1,654,021	$1,149,552	– $504,469	– 30%
Mill Creek, Kane County, IL**	$12,510	$9,099	– $3,411	– 27%
Prairie Glen, Germantown, WI	$1,004,848	$599,536	– $405,312	– 40%
Somerset, Prince George's County, MD	$2,456,843	$1,671,461	– $785,382	– 32%
Tellabs Corporate Campus, Naperville, IL	$3,162,160	$2,700,650	– $461,510	– 15%

* Negative values denote reduced cost for the LID vs. conventional development.

** Mill Creek costs are reported on a per-lot basis.

Source: *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices* (United States Environmental Protection Agency, Nonpoint Source Control Branch); 2007

Green or Low Impact Development (LID) is, in most cases, more cost effective than conventional stormwater management practices. The EPA has put together a report of 17 different case studies using LID practices. **Table 5** (above) shows the monetary break down of some of the areas in their study. These values represent a multitude of green practices, such as; cluster building, bioretention, swales, permeable pavement, and vegetated landscaping to name a few. In all but one of the areas LID costs were lower than conventional methods. The higher cost of the Kenslington Estates area is due to each home having rooftop rainwater collection systems and the use of grasscrete parking throughout the development. The EPA's report does not factor in increased home value, recreational opportunities, home desirability, increased number of units developed, or improved aesthetics.

Principal Implementer: LCPC and Municipalities.

Implementation Support: Municipal Planning Commissions; Chesapeake Bay Foundation; Watershed Associations; Lancaster County Conservation District; Shade Tree Commissions; Lancaster County Conservancy; County GIS staff; and Pa DCNR.

Timeframe: Short-term

✔ Within six months of the adoption of *Blueprints*, LCPC will convene a workgroup to establish a long range/2025 countywide tree canopy target and action plan.

Timeframe: Mid-term

✔ Establish watershed-level tree canopy targets and action plans for all of the county's watersheds by 2017.

Related water resource issues: water quantity, water quality, infrastructure, stormwater.

Related planning programs: Act 167, Source Water Protection.

CHAPTER 4

Roles and Responsibilities

The universe of stakeholders engaged in water resources management is large and diverse. The 2011 Hourglass report "Cleaning Up the Chesapeake Bay – The Challenge for Lancaster County" identifies more than one-hundred agencies and organizations working on Bay related issues in the county alone! Add to that entrenched practices and the multitude of regulatory programs and requirements and the challenge of integrated water resources planning and management becomes very clear.

One way to begin moving towards true integrated water resources management is to employ "systems thinking." Systems thinking, as applied to integrated water resources management requires us to look beyond the individual role, function or program and see the hydrologic system in its entirety. It requires one to consider not only the site or limit of his or her operations, but rather to consider the entire watershed within which the system functions and the inter-relatedness of the various parts therein. For example, a road master may have responsibility for the MS4 program but that municipal separate storm sewer system may exist within a source water protection zone for a water system which is managed by a municipal authority. Each is regulated separately and they have separate functions but they both exist within a single hydrologic environment or water resource system and many of their goals may be the same.

Perhaps most important to the success of IWRM is a recognition that it requires a much more participatory and process-oriented approach.

The strategies outlined in **Chapter 3** are based on the systems thinking approach and are predicated on the notion that a higher degree of collaboration will occur. While the strategies are fairly straight forward, those implementing the plan may find it difficult to make the shift to integrated water resource management. Therefore, Detailed Action Plans which include step by step instructions for implementation will be available in the LCPC Smart Growth Toolbox.

In addition to the roles and responsibilities associated with implementing the individual actions identified in **Chapter 3,** each of the following entities has an ongoing role to play in ensuring the success of integrated water resources planning and management.

By working together, the overall goal of protecting, conserving and restoring surface and groundwater resources in Lancaster County will be realized.

County of Lancaster

The County of Lancaster, through the Lancaster County Planning Commission (LCPC), will have a role in implementing many of the strategies in this plan. This will involve creating resources such as water resource data packages that will enhance municipalities' ability to use GIS for planning and management and assisting municipalities in implementing the various actions outlined in *Blueprints*. In collaboration with the County GIS staff, LCPC staff will provide tree canopy analysis and guidance on establishing local tree canopy targets. The LCPC will also have primary responsibility for establishing a forum for communication and collaboration and convening a workgroup to set a countywide tree canopy goal. The LCPC and

those participating in the quarterly forums will be responsible for monitoring implementation of *Blueprints* and recommending changes to the strategies as needed. LCPC staff will continue to participate in local, regional, state and federal water resource related forums on behalf of the County. The County may also serve as the applicant and administrator of grants needed to implement this plan.

Recognizing that education is the key to understanding the need for action, the Lancaster County Environmental Center will enhance water resource education programming to schools, community organizations and the general public. The LCPC will continue to offer water resource oriented workshops and educational programs in partnership with appropriate agencies and organizations.

Municipalities

Per the requirements of Pennsylvania's Storm Water Management Planning Act (Act 167), every municipality in Lancaster County will be responsible for adopting or amending and implementing ordinances consistent with the stormwater management provisions of this plan and Act 167. This includes, at a minimum, adopting or amending stormwater management regulations within six months of adoption by the County Commissioners and approval by the PADEP. Municipalities will also need to play a key role in strategic actions related to improving planning and design and accelerating implementation of existing plans. Municipalities are integral to the success of integrated water resources management and therefore should be represented in the integrated water resource forums.

Authorities

Water and sewer authorities play a key role in protecting public health and the environment while delivering essential services to the community. They build, operate, maintain and replace the infrastructure. To ensure that these services continue to be provided in the most cost effective manner and in a way that is consistent with community goals, authorities will need to become more fully engaged in the comprehensive planning process. Authorities are integral to the success of integrated water resources management and therefore should be represented in the integrated water resource forums.

Pennsylvania Department of Environmental Protection (PADEP)

The PADEP will play a key role in enabling implementation of this plan by implementing the recommendations for integrated water resources management contained in the State Water Plan; providing assistance with developing source water protection plans; and continuing to provide guidance and technical assistance to municipalities and others involved in water resource management. Regulatory agencies are integral to the success of integrated water resources management. Therefore, the Pennsylvania DEP should be represented in the integrated water resource forums.

Pennsylvania Department of Transportation (PennDOT)

PennDOT impacts water resources in that they build and maintain roadways and associated facilities, provide funding for transportation projects, and serve as a member of the Lancaster County Transportation Coordinating Committee (Lancaster County's officially designated Metropolitan Planning Organization). As such, PennDOT can play a pivotal role in meeting the objectives outlined in *Blueprints*. Specifically, PennDOT is encouraged to coordinate with local officials, watershed associations and others to accelerate implementation of existing plans when designing construction or maintenance projects; support modification of the Transportation Improvement Plan (TIP) to incorporate betterments that protect or improve water quality; and, to review and amend criteria for funds they administer to ensure that public dollars are

not being invested in projects that exacerbate water quality problems.

With respect to stormwater management, PennDOT and Pennsylvania Turnpike Commission construction and road maintenance activities are regulated under 25 Pennsylvania Code Chapter 102. Design policy pertaining to stormwater management facilities for PennDOT and Pennsylvania Turnpike Commission roadways and associated facilities are provided in Sections 13.7 (Antidegradation and Post Construction Stormwater Management Policy) of PennDOT Publication No. 13M, Design Manual Part 2, as developed, updated, and amended in consultation with PADEP. By incorporating innovative stormwater BMPs into their projects and identifying those projects as Demonstration Sites, PennDOT can help promote better stormwater management in Lancaster County.

Because of the many ways that PennDOT impacts water resources, it should be represented in the integrated water resource forums.

Lancaster County Conservation District

As the state delegated administrator of various regulatory programs, the Lancaster County Conservation District (District) plays a key role in protecting the water resources of Lancaster County. In addition, the District employs a Watershed Specialist whose primary responsibilities are to provide technical, informational and organizational assistance that will improve watershed organization development and the quality and quantity of the County's surface and groundwater resources. In terms of implementing *Blueprints*, the District's key role is to communicate with the LCPC so that LCPC staff can effectively assist the District in achieving their goal of having a "Plan for Every Farm" by 2015. Because the District is the designated administrator of Pennsylvania's Erosion and Sedimentation permitting program (Chapter 102), collaboration around stormwater management will also be essential. Conservation Districts are integral to the success of integrated water resources management. Therefore, the Lancaster County Conservation District should be represented in the integrated water resource forums.

Non-Governmental Organizations (NGOs)

While this plan focuses quite heavily on actions that need to be taken by the public sector, non-governmental organizations (NGOs), such as watershed associations and the Lancaster County Conservancy (Conservancy), also have a key role to play in implementing *Blueprints*. In fact, many of the strategies will advance the efforts of NGOs through encouraging greater collaboration with the public sector. For example, by collaborating with a municipality in reviewing and amending the Capital Improvement Plan, a watershed association may identify opportunities to piggy-back on a capital project which could ultimately help a municipality meet MS4 permit obligations.

Some NGOs, such as watershed associations, the Conservancy, the Lancaster Farmland Trust, the Chesapeake Bay Foundation, and Lancaster County Clean Water Consortium – a program of the Conservation Foundation of Lancaster County – have been identified as implementation supporters for specific strategies.

Non-governmental organizations are integral to the success of integrated water resources management. Therefore, those NGOs that are most actively involved in water resource planning and management should be represented in the integrated water resource forums.

Funders

Without adequate resources, the goal of restoring local waters will not be achieved. Various funding agencies have been instrumental in directing resources to Lancaster County for the purpose of protecting, conserving and restoring water

resources. One of the benefits of integrated water resources planning should be the ability to be more successful in attracting funds and technical assistance to help with plan implementation. Through effective collaboration and cooperation, this plan and those that follow, should result in fewer grant applications but larger awards as a result of grouping like projects and applying for larger pools of money. Funders, therefore, are integral to the success of integrated water resources management and should be represented in the integrated water resource forums.

CHAPTER 5
Summary of Existing Plans

As stated in *Chapter 2 The Water Resource System,* water resources planning occurs at many levels according to various statutory requirements. Following is a summary of relevant water resources planning undertaken within the County.

1996 Water Resources Plan

Lancaster County's last water resources plan was published in 1996. The purpose of the 1996 *Water Resources Plan* was to protect groundwater resources, improve water supply planning, secure future drinking water supplies, and improve environmental quality. The 1996 Plan built on prior water resource studies conducted in 1966 and 1987. Implementation strategies focused on water supply and wellhead protection planning in order to ensure an adequate, safe water supply for the existing and future county population.

Significant accomplishments associated with the 1996 *Plan* include:

- Developed an Emergency/Disaster Preparedness Planning Guide for Water Treatment Facilities and Systems, as well as training sessions on how to use the guide and two table-top Contingency and Emergency Response Exercises for municipalities, water suppliers, and emergency responders.
- Determined that there are no designated Sole Source Aquifers in Lancaster County
- Several communities developed source water protection plans. See **Map 14**.
- Developed Act 167 Watershed Stormwater Management Plans for Mill Creek, Little Conestoga, Conestoga and Cocalico Creek watersheds
- Expanded streambank stabilization efforts in the county
- Delivered water resource education programs to local stakeholders
- Standardized training for County and local emergency service personnel to contain spills and leaks of hazardous substances.

The 1996 Water Resources Plan may be referred to for historical information about the water resource system.

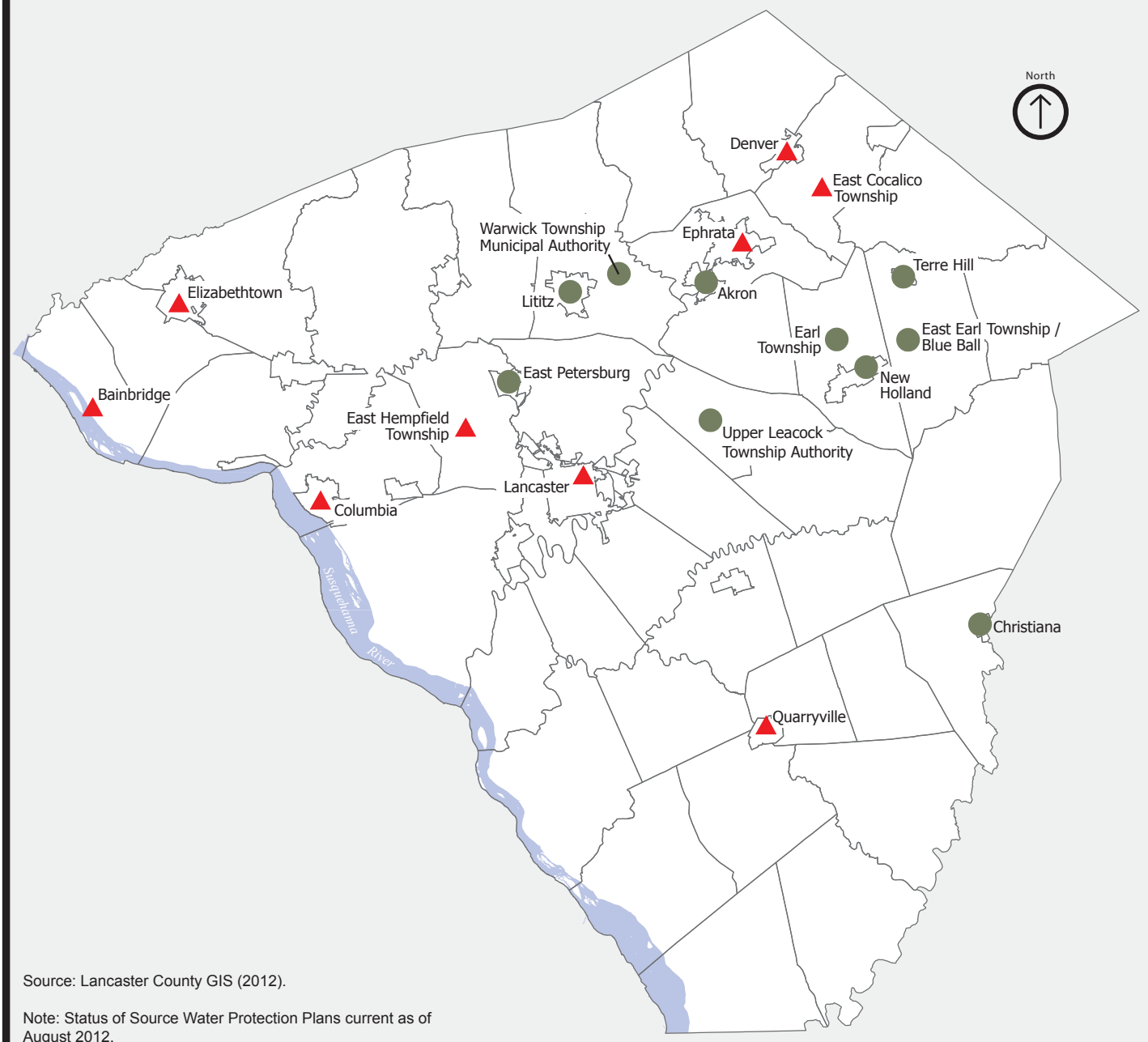
Source Water Protection Plans

In accordance with the 1996 *Safe Drinking Water Act,* Pennsylvania developed the Source Water Assessment Program (SWAP) to evaluate the drinking water sources that serve public water systems. Evaluations of all public water systems in Lancaster County are complete and reports are available on the PADEP web site. The SWAP is the basis for Source Water Protection (SWP) plans, which are developed by public water suppliers as a means of managing risks to the water supply.

State and local governments and water utilities play a critical role in protecting source water because protective actions must be tailored to unique local situations. PADEP's Source Water Protection Technical Assistance Program (SWPTAP) can help develop and establish local SWP programs. Assistance can be provided for developing a complete program or just specific elements needed to complete a program. An approvable local SWP plan contains six Minimum Elements:

- Local steering committee and public participation
- Source water protection area delineation
- Contaminant Source Inventory
- Source water protection area management methods and commitment

Map 14: Source Water Protection Planning Status, Lancaster County, PA



Integrated Water Resources Plan
Lancaster County Planning Commission
Lancaster County, Pennsylvania
Date: 14 September 2012
Scale: 1 inch = 6 miles
Projection: Pennsylvania State Plane South (feet)

Status of Source Water Protection Plan

- Plan Approved by PA DEP
- Plan In Development or Not Submitted for PA DEP Approval
- Municipal Boundaries

Disclaimer: This map is for reference or illustrative purposes only. This map is not a legally recorded plan, survey, or engineering schematic and it is not intended to be used as such. For complete disclaimer see http://www.co.lancaster.pa.us/gisdisclaimer.

- Contingency planning; and
- Protection of identified new source sites.

Source water protection plans include regulatory and/or non-regulatory management methods selected by the local steering committee.

The following communities have PADEP approved source water protection plans as of August 2012:

- Borough of Akron
- Earl Township/Western Heights Water Authority
- East Earl Township/Blue Ball Water Authority
- East Petersburg Borough
- Lititz Borough
- New Holland Borough
- Terre Hill Borough
- Upper Leacock Township Authority
- Warwick Township Municipal Authority

The following communities are in the process of developing SWP plans or have plans which have not been submitted for approval by PADEP:

- Bainbridge (Conoy Township)
- City of Lancaster
- Columbia Borough
- Denver Borough
- East Cocalico Township
- East Hempfield Township
- Elizabethtown Borough
- Ephrata Borough
- Quarryville Borough

Because of the sensitivity of some of the data contained in these plans, copies must be obtained directly from the water supplier.

Act 537 Sewage Facilities Plans

The Pennsylvania Sewage Facilities Act (Act 537) requires that all Commonwealth municipalities develop and implement comprehensive official plans that provide for the resolution of existing sewage disposal problems, provide for the future sewage disposal needs of new land development and provide for the future sewage disposal needs of the municipality. PADEP reviews and approves Act 537 Plans and any subsequent revisions.

A Countywide Act 537 Comprehensive Sewerage Plan, adopted in 1970, has served as the official Sewage Facilities Plan for those municipalities listed below who have not yet developed and implemented their own Act 537 Plan. In 1987, the Lancaster County Planning Commission commissioned the "Lancaster County Sewer and Water Resources Study." The purpose of this study was to develop updated information and policy recommendations to help guide and direct the LCPC and its staff in day-to-day reviews and decision-making. The Study includes an update of parts of the 1970 Comprehensive Sewerage Study; however, it was never adopted as an official update to the County's Act 537 Plan.

Map 15 shows the status of Act 537 Planning in Lancaster County as of January 2011.

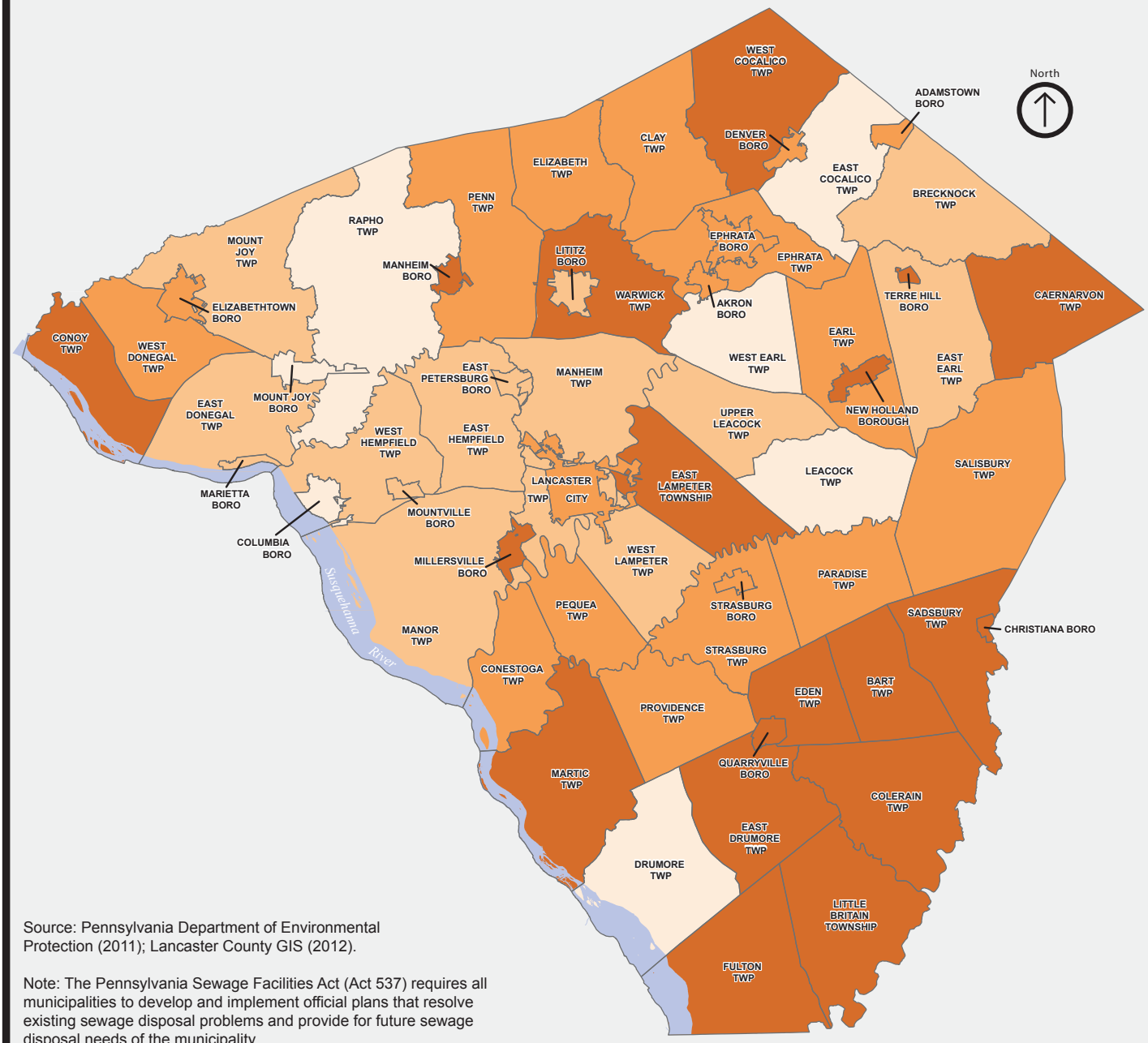
The following municipalities still rely on the County's 1970 Comprehensive Sewerage Plan (Act 537 Plan):

- Caernarvon Township
- Colerain Township
- Eden Township
- Fulton Township
- Little Britain Township
- Marietta Borough
- New Holland Borough

Systems Thinking: SWP

There is a very strong connection between source water protection and other water resource management initiatives, such as sewage facilities planning and stormwater management. Many of the best management practices generally associated with water quality improvement, such as conservation planning and nutrient/manure management, are also imperative to protecting source water.

Map 15: Act 537 Plan Age, Lancaster County, PA



Source: Pennsylvania Department of Environmental Protection (2011); Lancaster County GIS (2012).

Note: The Pennsylvania Sewage Facilities Act (Act 537) requires all municipalities to develop and implement official plans that resolve existing sewage disposal problems and provide for future sewage disposal needs of the municipality.

PNM

Integrated Water Resources Plan
Lancaster County Planning Commission
Lancaster County, Pennsylvania
Date: 14 September 2012
Scale: 1 inch = 6 miles
Projection: Pennsylvania State Plane South (feet)

Age of Act 537 Plan

- Less than 5 years
- 5-10 years
- 11-20 years
- 21-40 years
- Municipal Boundaries

- Upper Leacock Township

While many municipalities have developed their own Act 537 plans and those plans have been approved by PADEP, many fail to adequately address rural wastewater challenges. Most lack sufficient guidance on how to handle failing on-lot disposal systems (OLDS) in rural areas where extending public sewers is not only cost prohibitive but contrary to adopted growth management policies as well. Few plans adequately evaluate alternatives such as community on-lot systems. The lack of viable solutions often results in a retreat from designating clusters of failing systems as "needs areas" but instead refers to them as "future needs areas" which only delays the inevitable.

Act 167 Watershed Stormwater Management Plan

The Pennsylvania General Assembly, recognizing the adverse effects of inadequate management of storm water runoff resulting from development, approved the Storm Water Management Act (Act 167) in 1978. Act 167 provides for the regulation of land and water use for flood control and storm water management purposes. Act 167 establishes a systematic program for counties to develop comprehensive watershed-based stormwater management plans that provide control measures for development and activities that affect stormwater runoff including; quality, quantity, groundwater recharge, peak flow control and flood control.

Prior to the adoption of *Blueprints*, the County prepared detailed watershed stormwater management plans for Mill Creek, Little Conestoga Creek, Cocalico Creek, and the Conestoga River watersheds. Those plans have been reviewed and relevant components, including identified problem areas **(Appendix A)** and release rates, have been incorporated into *Blueprints* which serves as the County's adopted Act 167 Watershed Stormwater Management Plan. Refer to the **Bibliography** for links to prior Act 167 plans.

Greenscapes, the Green Infrastructure Element of the County Comprehensive Plan

Adopted in 2009, *Greenscapes* served as the de facto water resources plan for the county for the last several years. *Greenscapes* defined the county's Green Infrastructure network as encompassing a wide range of landscape elements, including: natural areas such as wetlands, woodlands, waterways, and wildlife habitat; public and private conservation lands, such as nature preserves, wildlife corridors, greenways and parks; and public and private working lands of conservation value, such as forests and farms. Through the vision, goals, objectives and strategies outlined in *Greenscapes*, a framework for protection, conservation and restoration of the county's water resources has been established. *Blueprints* builds on that, providing more specific strategies for utilizing green infrastructure for its ecological functions.

Northern Lancaster County Groundwater Study: A Resource Evaluation of the Manheim-Lititz and Ephrata Area Groundwater Basins

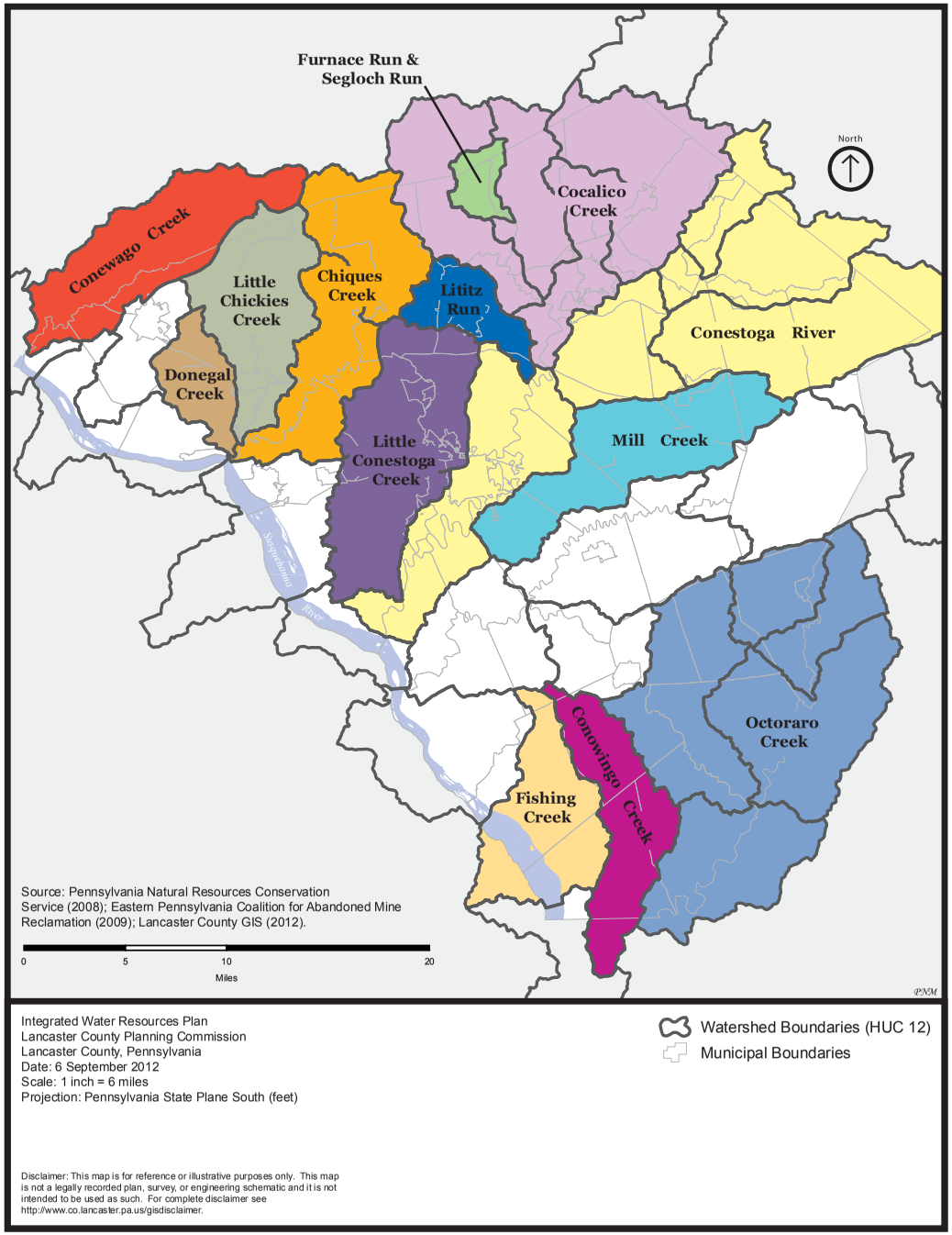
This study, prepared by the Susquehanna River Basin Commission in partnership with the Lancaster County Conservation District, evaluated the groundwater resources of a carbonate valley that encompasses parts of thirteen municipalities and spans from Rapho Township in the west to East Cocalico Township in the east (see **Map 10)**. While the existing allocations for groundwater withdrawal were found to be sufficient to meet projected demand, the study identified four major issues, including: overall reduction of infiltration and groundwater recharge; excess withdrawal of groundwater in Potentially-Stressed Areas (**Map 9**); overall increase in water use; and consistency among municipal ordinances. The study includes rec-

Map 16: Existing Watershed Plans in Lancaster County, PA

Key	Watershed Name	Type of Plan
	Chiques Creek	Watershed Assessment / TMDL
	Cocalico Creek	Watershed Restoration Plan
	Conestoga River	Rivers Conservation Plan **
	Conewago Creek	Watershed Implementation Plan (319 Plan) / TMDL *
	Conowingo Creek	Watershed Implementation Plan (319 Plan) / TMDL *
	Donegal Creek	Restoration Booklet / TMDL
	Fishing Creek	Rivers Conservation Plan
	Furnace Run and Segloch Run	Coldwater Conservation Plan
	Lititz Run	Watershed Action Plan / TMDL
	Little Chiques Creek	Rivers Conservation Plan
	Little Conestoga Creek	Watershed Assessment and Restoration Plan
	Mill Creek	Watershed Implementation Plan (319 Plan) / TMDL *
--	Muddy Run	None / TMDL
	Octoraro Creek	Rivers Conservation Plan **
--	Pequea Creek	None / TMDL

** Note:* A Watershed Implementation Plan ("WIP" or "319 Plan"), identifies specific measures for improving the condition of the watershed to meet the requirements of an approved TMDL. These plans, which have been prepared with funding under Section 319 of the *Clean Water Act,* enable communities to access additional "319" funds for implementation. Assistance with implementation of TMDL WIPs has historically been provided by the Lancaster County Conservation District's Watershed Specialist and PADEP's Section 319 Program.
** TMDL is in progress

Source: Lancaster County Conservation District. *Lancaster County Watersheds*. Web. 2012. http://www.lancasterwatersheds.org/watershedplans.php



ommendations to address these issues, many of which have been incorporated into *Blueprints*.

Other Watershed-Based Plans

In addition to the plans listed above, a variety of other watershed-based plans have been produced which may help guide future actions in the County. In general these plans, which include Watershed Restoration Plans and River Conservation Plans, describe the watershed, identify threats or problems associated with the resource, and describe actions that can be taken to protect or restore the resource. **Map 16** identifies those watersheds with some type of watershed conservation or restoration plan as of September 2011. These plans are available for download at lancasterwatersheds.org.

Federal, State and Regional Plans

Coming Together for Clean Water: EPA's Strategy to Protect America's Waters

Recognizing that the statutes, regulatory framework, and institutions that were created over the last forty-years or more are still central to protection of today's water resources, *Coming Together for Clean Water: EPA's Strategy to Protect America's Waters* ("EPA's Strategy") acknowledges that "the challenges faced today are different than they were a decade or more ago; there is a need for baseline information on the status of water quality nationally; impaired water listings are increasing at an alarming rate; nitrogen and phosphorous pollution are potentially the costliest and most challenging water quality issues of the 21st century; climate change, population increase, urbanization, and degradation of water and wastewater infrastructure will compound the challenge; drinking water is threatened nationally by a number of cumulative impacts; disadvantaged communities are often disproportionately impacted by water quality impairments; and, the public is largely unaware of the severity of current and future challenges."

Coming Together for Clean Water highlights the EPA's priorities for achieving clean water goals. Specific actions associated with the following areas of EPA's Strategy align with the strategies in *Blueprints*: 1. Increase protection of healthy waters; 2. Restore waters; 3. Reduce pollution from discrete sources; and 4. Enhance watershed resiliency and revitalize communities.

Pennsylvania State Water Plan

Pennsylvania's State Water Plan (2009), developed in accordance with the requirements of the Water Resources Planning Act of 2002 (Act 220), provides a vision, goals and recommendations for sustainable water use over a fifteen year time frame. The plan consists of inventories of water availability, an assessment of current and future water use demands and trends, assessments of resource management alternatives, and proposed methods of implementing recommended actions.

Principal priorities outlined in the State Water Plan are as follows: 1. The efforts initiated in the plan to collect, interpret, and disseminate water resources information should continue into the future; 2. An integrated approach to managing water resources should be encouraged and sustained; and 3. The commonwealth should adopt policies that encourage technological advances designed to conserve and enhance water resources.

Two priorities for the Lower Susquehanna River Basin were identified by the Lower Susquehanna Regional Water Resources Committee:

- Evaluate Supply and Demand – Accurate water supply and demand projections are necessary in order to improve the capability to plan for the social, economic, environmental and recreational needs of the Lower Susquehanna region. This information serves as the basis for making decisions on land use planning,

for identifying and analyzing Critical Water Planning Areas, and for making comprehensive preparations in advance of extreme floods and droughts.

- Protect "at-risk" water resources and reduce or prevent point and nonpoint source pollution with a focus on impaired streams
  – The Lower Susquehanna Basin has a significant number of impaired streams (approximately 3,400 miles, 20% of total stream miles) caused by various point and nonpoint sources of pollution. A major priority of PADEP is to reduce or prevent this pollution and to focus added attention on "at-risk" water resources.

The most significant area of alignment between the State Water Plan and *Blueprints* is the focus on integrated water resources management.

Pennsylvania Chesapeake Bay Watershed Implementation Plan

The Pennsylvania Chesapeake Bay Watershed Implementation Plan (PA WIP) is Pennsylvania's plan for meeting the Chesapeake Bay Total Maximum Daily Load (TMDL) established by the U.S. EPA in December 2010. The Chesapeake Bay TMDL requires reductions of nitrogen, phosphorous and total suspended solids (sediment) from all jurisdictions within the Chesapeake Bay Watershed.

The PA WIP identifies programs and practices that will reduce pollutants from agricultural lands, forests, wastewater treatment plants, construction sites and developed lands in cities, boroughs and townships. The goal is to have 100% of the controls and practices required to meet the TMDL in place by 2025. An interim target of 60% implementation has been set for 2017.

The WIP is being developed in three distinct phases. The Phase 1 WIP, which was finalized in January 2011, is a general roadmap for achieving the pollutant reductions required of Pennsylvania as a whole. The Phase 2 WIP, which was approved by the EPA in May 2012, explains how Pennsylvania will work with key partners, including local governments, to put the necessary practices in place by 2025. Phase 3, which must be submitted to EPA in 2017, will address any refinements necessary between 2018 and 2025 to ensure that the 2025 goal is met.

While the PA WIP lacks any specific guidance about actions necessary to achieve reductions at the county or municipal level, it may help to inform local planning efforts in the future.

Comprehensive Plan for the Water Resources of the Susquehanna River Basin

The Susquehanna River Basin Commission's (SRBC) *Comprehensive Plan for the Water Resources of the Susquehanna River Basin* (2008) provides a framework for management and development of the basin's water resources and serves as a guide for all SRBC programs and activities. The Plan is also intended as a resource for SRBC's member jurisdictions, water resource managers, private sector interests and others in the basin.

The SRBC also adopts a Water Resources Program each year based on their adopted Comprehensive Plan. The annual Water Resources Program is the mechanism for implementing the "Actions Needed" as listed in the Plan under the six Priority Management Areas – (A) Water Supply, (B) Water Quality, (C) Flooding, (D) Ecosystems, (E) Chesapeake Bay, and (F) Coordination, Cooperation, and Public Information.

While all of these priority management areas are important to Lancaster County, several actions identified in Priority Management Areas A and B (water supply and water quality respectively) of the Annual Water Resources Program for Fiscal Years 2013–2014 align most closely with the strategies included in *Blueprints*.

CHAPTER 6
Tools and Resources

The tools and resources identified below will be useful in implementing the strategies contained in *Blueprints*. Additional tools and resources will be included in the County's Smart Growth Toolbox as they become available.

Model Stormwater Management Ordinance

Section 11 of Act 167 states that "Within six months following adoption and approval of the watershed storm water plan [*Blueprints*], each municipality shall adopt or amend, and shall implement such ordinances and regulations, including zoning, subdivision and development, building code, and erosion and sedimentation ordinances, as are necessary to regulate development within the municipality in a manner consistent with the applicable watershed storm water plan and the provisions of this act."

While a municipality may comply with Act 167 by incorporating necessary standards into existing ordinances and regulations, most municipalities choose to adopt a stand-alone Stormwater Management Ordinance. Therefore, *Blueprints* contains a Model Stormwater Management Ordinance (LCPC, 2012) to assist municipalities in complying with Act 167. The Model Ordinance incorporated herein by reference also provides standards to meet NPDES permit requirements.

To achieve consistency with *Blueprints* those municipalities who choose not to use the county's Model Ordinance should ensure that local ordinances/regulations include the following minimum performance standards:

1. ***Volume Control*** – Do not increase the post development total runoff volume for all storms equal to or less than the 2-year 24-hour storm event. At least the first one inch (1") of runoff from new impervious surfaces or an equivalent volume shall be permanently removed from the runoff flow, i.e. it shall not be released into the surface Waters of this Commonwealth. The intent of volume control BMPs is to maintain the existing hydrologic conditions for small storm events by promoting groundwater recharge and/or evapo-transpiration. See Model Ordinance Section 302. Volume Controls for additional guidance.
2. ***Rate Controls*** – Match the pre-development hydrograph. Where the pre-development hydrograph cannot be matched and the area is not subject to a release rate of less than 100%, post-development discharge rates shall not exceed the pre-development discharge rates for the 2, 10, 25, 50 and 100-year 24-hour storm events. In areas with defined release rates of less than 100%, the post-development peak discharge rate will follow the applicable approved release rate for the 2, 10, 25, 50 and 100 year 24-hour or an IDF Curve Rational Method storm. See Model Ordinance Section 303. Rate Controls for additional guidance. Defined release rates from previously adopted and approved Act 167 plans for the Mill Creek, Little Conestoga Creek, Cocalico Creek and Conestoga River watersheds are incorporated herein by reference as described in **Chapters 2 and 5.**

To be consistent with *Blueprints,* local ordinances should meet the following purposes:

- Preserve the natural drainage systems as

much as practicable.
- Manage stormwater runoff close to the source.
- Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- Prevent scour and erosion of stream banks and streambeds.
- Provide proper Operation and Maintenance of Stormwater Management Best Management Practices (SWM BMPs).
- Minimize stormwater runoff through the use of nonstructural Best Management Practices (BMPs).
- Provide a regulatory environment that supports the proportion, density and intensity of development called for in *Balance, the Growth Management Element of the County Comprehensive Plan;* allow for creative methods of improving water quality and managing stormwater runoff; and promote a regional approach to water resource management.
- Help preserve and protect exceptional natural resources, and conserve and restore natural resource systems.
- Promote stormwater management practices that emphasize infiltration, evaporation, and transpiration.

Municipal stormwater regulations must also be compliant with Act 167, as well as meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93.

Municipalities may enact additional and/or more stringent regulations, including detailed design criteria as needed. Such additional regulatory provisions are acceptable only if they neither conflict with nor subvert *Blueprints* and the standards contained in the Model Ordinance. When incorporating design criteria, municipalities should take care not to become so prescriptive that they restrict designers' creativity.

LCPC staff will provide additional guidance on achieving consistency with *Blueprints* through informal staff reviews and individual consultations.

Wastewater Strategies for Rural Areas

This tool provides a wastewater evaluation process that can be used by municipalities and developers to evaluate feasible, environmentally sound wastewater management alternatives to large public systems that will meet the goals of the county and local comprehensive plans.

This tool can be used by municipalities who wish to explore wastewater management alternatives appropriate for rural centers or identified needs areas outside urban growth areas. Municipalities can use it as a supplement to a full Act 537-compliant sewage facilities plan, as a component of a municipal comprehensive planning process, or as a means of planning for wastewater management as part of the Rural Areas Designation process.

This tool is available in the Lancaster County Smart Growth Toolbox online.

Model Conservation Zoning District and Natural Resource Protection Standards

The Lancaster County Planning Commission has developed two zoning tools for municipalities to consider integrating into existing zoning ordinances: a collection of Natural Resource Protection Standards and the Model Conservation Zoning District. Both are focused on incorporating natural resource identification and protection into subdivision and development proposals through site specific performance standards.

A municipality can use the model Natural Resource Protection Standards to help the community conserve specific resource types throughout its boundaries. The Conservation District model

is useful for implementing planning goals in distinct areas, providing linkages to the Preservation and supporting Conservation lands identified in *Greenscapes*, as well as the Designated Natural Areas of *Balance*. Ideally, a municipality's use of both the underlying Conservation Zoning District and the Natural Resource Protection Standards will result in both broad and targeted conservation benefits, respectively.

This tool is available in the Lancaster County Smart Growth Toolbox online.

Additional Resources and Reference Materials

The following resources may also be helpful in implementing *Blueprints*:

Water Resource Spatial Data Packages. Following adoption of *Blueprints*, the LCPC, in cooperation with the County GIS Division, will provide each municipality with a water resource spatial data package that can be used with ArcGIS or ArcReader. The spatial data will include but not necessarily be limited to the following layers: watershed boundaries, stream quality, Urbanized Areas (for MS4 permittees), and infrastructure service areas if applicable.

Tree Canopy Assessments. The LCPC, in cooperation with the County GIS Division, will conduct tree canopy assessments in support of local efforts to establish tree canopy targets and action plans. The assessments will be conducted based on land cover data derived from high-resolution aerial imagery and LiDAR which was made available to the County by the Pa Department of Natural Resources, Bureau of Forestry, the University of Vermont, and the Northern Research Station.

2008 Natural Heritage Inventory of Lancaster County, Pennsylvania. This document identifies areas of environmental and ecological significance for the protection of the County's plant and animal species diversity. It also suggests actions that can be taken by public, private, and non-profit entities to protect and preserve these important natural resources.

US EPA. ***Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood and Site Scales.*** October 2009.

Alliance for the Chesapeake Bay. ***Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships, and Lancaster County, Pennsylvania.*** November, 2004.

The LCPC staff will provide presentations and offer workshops as needed to support implementation of *Blueprints*.

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APPENDIX A

Drainage Problems as Identified by Municipal Survey

Chiques/Little Chiques/Donegal Creek Watershed Questionnaire Results (conducted 2004 and 2009)

Specific Problems:

CORNWALL BORO, LEBANON COUNTY

Critical soil washoff problems more than once a year. Caused by drainage system being too small. Results in damage to private and public property. Specific problem areas are as follows;

1. Spring Hill Acres development - this development was built in the 1970s and lacks an adequate stormwater conveyance system. Problems include shoulder washouts and erosion.

MOUNT JOY BORO, LANCASTER COUNTY

Generally minimal or no problems. There is erosion of soil and flooding of roadways in the following places;

Specific problem areas are as follows;

2. Outfall of pipe from Stauffer Court and erosion of the rear yard it discharges to, and the banks of the Little Chiques Creek. The drainage system was built in the 1950s and floods more than once a year. The problems are caused by the drainage system being too small, and uncontrolled runoff from upstream municipalities.
3. Low drainage area from Amtrak with insufficient capacity to carry flow under Route 230. An upgrade is needed across Route 230 to the proposed new development to the North. The problem is caused by the drainage system being too small - flooding occurs more than once a year.
4. Release of water from underground drainage system to the surface. An upgrade is currently underway utilizing the wet pond from "The Lakes" development. The problem is caused by the drainage system being too small.

Flooding occurs more than once a year.

PENN TWP., LANCASTER COUNTY

Critical stream and street flooding in certain areas. Damage to private and public property, property damage, and loss of vital services.

Specific problem areas are as follows;

5. Stiegel Valley Rd./White Oak Rd. intersection, and along White Oak Rd. South of Hamaker Rd. Caused by undersized drainage system and lack of maintenance of drainageways. Occurs more than once a year.
6. Fruitville Pike/Main Street (Pa. 72) intersection, caused by obstructions in the system that must be removed and by lack of maintenance of drainageways. Problem occurs more than once a year.

RAPHO TWP., LANCASTER COUNTY

Some problems with stream and street flooding, particularly in the Southern end of the township.

Problems with soil washoff in the agricultural community. Caused by streams being clogged with debris and low lying roads close to streams. Increasing development adds to the problems. Problems occur more than once a year, depending on rain volume and ground saturation. Results in some road closings, and probable damage to private property.

Specific problem areas are as follows;

7. Lonenecker Road floods - the road is low and close to the stream.
8. Garfield Road across Chiques Creek - minor flooding (bridge to be replaced).
9. Drager Road - low lying road adjacent to Little Chiques Creek.
10. Newcomer Road is prone to flooding - two bridges (Newcomer Road and Eby Chiques Road bridges) to be replaced.
11. Meadow View Road is prone to flooding.
12. Pinkerton Road occasionally floods.

No Problem Areas in the watershed:

EAST DONEGAL TWP., LANCASTER COUNTY
MARIETTA BORO., LANCASTER COUNTY
SOUTH LEBANON TWP., LEBANON COUNTY
SOUTH LONDONDERRY TWP., LEBANON COUNTY
WEST CORNWALL TWP., LEBANON COUNTY
WEST DONEGAL TWP., LANCASTER COUNTY
WEST HEMPFIELD TWP., LANCASTER COUNTY

No Response:

EAST HEMPFIELD TWP., LANCASTER COUNTY
ELIZABETH TWP., LANCASTER COUNTY
MANHEIM BORO., LANCASTER COUNTY
MOUNT JOY TWP., LANCASTER COUNTY

Cocalico Creek Watershed Questionnaire Results (conducted 2000–2001)

No Problem Areas:

CORNWALL BORO., LEBANON COUNTY
MILLCREEK TWP., LEBANON COUNTY
PENN TWP., LANCASTER COUNTY
SPRING TWP., BERKS COUNTY
WARWICK TWP., LANCASTER COUNTY

General Problems:

ADAMSTOWN BORO., LANCASTER COUNTY
General stream and street flooding, conveyance problems, and impacts on threatened species (Bog Turtles). Also small lot sizes near flood plain that are too small to be developed or expanded with storm water detention facilities. Possible impact due to Route 222 project. Caused by too large an increase in uncontrolled runoff, uncontrolled runoff from upstream municipalities, lack of maintenance of drainage ways, drainage system is too small and has obstructions that need to be removed.

CLAY TWP., LANCASTER COUNTY
Flooding of farmland around bridges in major events

ELIZABETH TWP., LANCASTER COUNTY
General soil washoff and stormwater pollution problems more than one time per year, caused by undersized drainage system(s)

EPHRATA TWP., LANCASTER COUNTY
General minor roadway/gutter damage - occurs more than 1 time per year, due to uncontrolled flow from upstream municipalities and undersized drainage system(s)

MANHEIM TWP., LANCASTER COUNTY
General flooding of farm crossings in major events, caused by obstructions, lack of maintenance of drainage ways, increase in uncontrolled runoff, drainage from upstream municipalities, and undersized drainage system(s)

WEST EARL TWP., LANCASTER COUNTY
General stream and street flooding, soil washoff and stormwater pollution problems more than 10 times per year. Trash and debris wash into the Township during major events. Caused by too large an increase in uncontrolled runoff, uncontrolled runoff from upstream municipalities, and lack of maintenance of drainage ways. Also, not enough Erosion and Sedimentation control in the farming community. Not enough terraces and waterways built.

Specific Problems:

AKRON BORO., LANCASTER COUNTY
1. Heritage development along Cocalico Creek - minor property damage, infiltration into sewer system

DENVER BORO., LANCASTER COUNTY
2. 300 and 400 blocks of Locust Street - basement flooding, vehicle and road surface deterioration occurs more than 10 times per year, cased by lack of underground drainage
3. N. 3rd and Main Street - basement flooding, vehicle and road surface deterioration - occurs more than 1 time per year, cased by lack of underground drainage East Cocalico Twp., Lancaster County
4. Little Cocalico Creek and Ridge Road - Stream flooding, Soil washoff, Bridge opening
5. Intersections of Smokestown, Miller, and Reinholds Road at confluence of Little Cocalico Creek and Fry's Run -Stream flooding, Bridge opening
6. Fry's Run at Dogwood Drive -Stream

flooding, Bridge opening
7. Fry's Run at White Oak Road -Stream flooding, Street flooding, Bridge opening
8. Fry's Run at Smokestown Road -Stream flooding, Street flooding, Bridge opening
9. Stony Run at Hill Road -Street flooding, Bridge opening
10. Cocalico Creek in vicinity of West Church Street -Stream flooding
11. Stony Run at Bunker Hill Road -Street flooding, Bridge opening
12. Stony Run at West Church Street -Street flooding, Bridge opening
13. Cocalico Creek at Cocalico Creek Road -Stream flooding
14. Haldemans Mobile Home Park (Justin Circle and Wabash Road) -Stream flooding

* Stormwater pollution at High Concrete Yard (not shown on map)

EPHRATA BORO., LANCASTER COUNTY

15. Nissley Acres (Niss, Bellevue, and James Avenues) flooding occurs during major events, caused by too large an increase in uncontrolled runoff and uncontrolled runoff from upstream municipalities
16. 600 Block of W. Main Street - occurs during major events, caused by undersized drainage system and lack of maintenance of drainage ways
17. Walnut Street East - occurs during more than 10 times per year, caused by undersized drainage system (problem is being corrected)

HEIDELBERG TWP., LEBANON COUNTY

18. 18. Stream flooding on Hammer Creek - occurs in major events, caused by natural constriction of drainage way - causes minor road damage

SOUTH HEIDELBERG TWP., BERKS COUNTY

19. Stream flooding on Mill Road - occurs in major events, caused by undersized drainage system(s)

SOUTH LEBANON TWP., LEBANON COUNTY

20. Hammer Creek at intersection of Schaeffer and Rexmont Roads - Road flooding - occurs more than once per year, caused by too large an increase in uncontrolled runoff
21. Hammer Creek and Obie Road - Road flooding - occurs more than once per year, caused by too large an increase in uncontrolled runoff
22. Hammer Creek between Obie Road and Heidelberg Twp. line - Stream flooding - occurs more than once per year, caused by too large an increase in uncontrolled runoff

WEST COCALICO TWP., LANCASTER COUNTY

23. Confluence of Cocalico Creek and Hickory Road - flooding occurs more than 10 times per year, caused by undersized drainage system, obstructions in system, and lack of maintenance of drainage ways - road is too low in relation to the pipe under the road
24. Confluence of Cocalico Creek and bridge over Pineview Drive - flooding occurs during major events, caused by undersized drainage system - bridge approach is low
25. Confluence of Trout Run Creek and Hackman Road - flooding occurs during major events, caused by too large an increase in uncontrolled runoff - dangerous in major events
26. Sportsman Road and Cocalico Creek

No other information provided

27. Peartown Road South of Rt. 897
28. Long Lane at Denver Borough line
29. Cocalico Creek at Greenville Road and Leisey Road - potentially dangerous during major events – no other information provided

Conestoga River Watershed Questionnaire Results (conducted 2003–2004)

Specific Problems:

BRECKNOCK TWP., LANCASTER COUNTY
Critical stream and street flooding, soil washoff, and storm water pollution problems in every storm. Caused by too large an increase in uncontrolled runoff, drainage system being too small and must be corrected, obstructions in the system that need to be removed, and lack of maintenance of drainage ways .Results in possible loss of life due to flooded roads, some areas of the Township being completely cut off from access to any road. Damage to property is usually minor. Farming practices and development has upset the normal flows of water runoff to the point where storm water problems are everywhere in the Township.

1. Areas of major stream flooding (crops and properties under water).
2. Areas of flooded roads which require "High Water" and "Road Closed" signs in every storm.
3. Areas of soil washoff and stream pollution mostly as a result of farming practices.

CAERNARVON TWP., BERKS COUNTY
Critical stream flooding with resultant street flooding in certain areas. Damage to private and public property (yards, and streets) consisting of erosion and sedimentation.

4. Mill Road South of Valley Road, street flooding at least twice a year. Caused by drainage system that is too small and needs to be replaced.
5. Willow Glen Road - flooding at least twice a year. Caused by drainage system that is too small and needs to be replaced. Caused by runoff from farm fields and airport runway.

CONESTOGA TWP., LANCASTER COUNTY
Critical street flooding. Damage to private and public property (homes, yards, and streets) in every storm. Caused by drainage system being too small, obstructions in system that need to be removed, and lack of maintenance of drainage ways.

6. Orchard Hills Development (Supervisors have approved work to correct problem).
7. Kendig Road at Elm Street, low spot in the road floods.

EARL TWP., LANCASTER COUNTY

8. Cabin Road near Township line - flooding more than once a year due to overflowing stream banks.
9. Rt. 322, West of Martindale Road - flooding more than once a year due to overflowing stream banks.

EAST EARL TWP., LANCASTER COUNTY
Critical stream and street flooding, soil washoff, and storm water pollution problems in major flood events. Caused by too large an increase in uncontrolled runoff.

10. Areas of roadway flooding.
11. Roadway flooding on Pa. Route 897 caused by runoff from Welsh Mountain and farm fields.

EAST LAMPETER TWP., LANCASTER COUNTY
Critical stream and street flooding, and storm water pollution problems more than one time per year.

Caused by too large an increase in uncontrolled runoff, runoff from upstream municipalities, and drainage system(s) too small that needs to be corrected. Results in damage to commercial and residential property.

12. Millcross Road.
13. Eastwood Village.
14. Pitney Road.

15. Greenfield Road at railroad underpass.

EPHRATA TWP., LANCASTER COUNTY
Moderate stream and street flooding and soil washoff problems. Minor storm water pollution problems. Problems result in road closings.

16. Frysville Road / Newswanger Road intersection - flooding from small stream more than once per year. Caused by drainage system that is too small and needs to be replaced.
17. Frysville Road / Fry's Road, flooding from two small streams and Muddy Crk. in major flood events.

LANCASTER CITY, LANCASTER COUNTY
Minor street flooding and storm water pollution problems. Minor combined sewer overflow problems.

Caused by drainage system being too small and needing to be replaced. Results in road closings/ disruption of transportation system more than once per year.

18. North Plum Street at railroad underpass.
19. Wabank Road 70' West of Hershey Avenue.
20. New Holland Avenue at railroad overpass (East of Ross Street).
21. Chesapeake and Broad Streets.

LITITZ BORO., LANCASTER COUNTY
Potential problems with stream and street flooding in heavy storms more than once per year.

Caused by uncontrolled runoff from upstream municipalities. Results in property damage to public park and business.

22. Lititz Springs Park.
23. Lititz Run during heavy storms.

MILLERSVILLE BORO., LANCASTER COUNTY
Moderate stream and street flooding and soil washoff problems caused by drainage system being to small and corrections need to be made.

24. Oak Ridge Drive - street flooding more than once per year.
25. Barbara Street at East College Avenue - street flooding and soil washoff more than once per year.
26. Creek Drive - stream flooding in major events.

UPPER LEACOCK TWP., LANCASTER COUNTY
Critical stream and street flooding, soil washoff, and storm water pollution problems more than one time per year.

Caused by too large an increase in uncontrolled runoff and overwhelmed or clogged inlet grates.

Results in road closures.

27. Snake Hill Road at Conestoga River (stream/street flooding).
28. Mondale Road at Conestoga River (stream/street flooding).
29. Creek Hill and Hartman Station Roads (soil washoff).

WARWICK TWP., LANCASTER COUNTY
Some stream flooding more than one time per year, caused by drainage system being too small and corrections need to be made. Results in road closures.

30. Lititz Run Road culvert - flooding across cartway.
31. Millport Road Bridge - flooding across cartway.

WEST EARL TWP., LANCASTER COUNTY
Critical stream and street flooding, and soil washoff problems more than one time per year.

Results in loss of life, loss of vital services, private and public (to parkland) property damage.

32. Cabin Road.
33. North Farmersville Road.
34. Turtle Road (100 Block).
35. South State Street, Talmage (Conestoga River).
36. South State Street, Talmage (Groff Creek).
37. South Fairmount and Sawmill Roads.
38. South Farmersville Road.
39. Sheaffer's School Road.

WEST EARL TWP., LANCASTER COUNTY
Critical stream and street flooding, and soil washoff problems.

40. West side of Lampeter Road between Wiker and Plymouth Avenue - major flooding more than once per year.

No Response

AKRON BORO., LANCASTER COUNTY
EAST COCALICO TWP., LANCASTER COUNTY
ELVERSON BORO., CHESTER COUNTY
LANCASTER TWP., LANCASTER COUNTY
MANHEIM TWP., LANCASTER COUNTY
MANOR TWP., LANCASTER COUNTY
SPRING TWP., BERKS COUNTY

No Problem Areas in the Conestoga River watershed

ADAMSTOWN BORO., LANCASTER COUNTY
ELIZABETH TWP., LANCASTER COUNTY
NEW MORGAN BORO., BERKS COUNTY
PENN TWP., LANCASTER COUNTY
PEQUEA TWP., LANCASTER COUNTY
ROBESON TWP., BERKS COUNTY
TERRE HILL BORO., LANCASTER COUNTY
WEST NANTMEAL TWP., CHESTER COUNTY

General Problems

BRECKNOCK TWP., BERKS COUNTY
Critical street flooding, soil washoff and stormwater pollution problems. Critical problems with aquifer recharge (i.e. not enough infiltration is being done) and potential groundwater pollution.

CAERNARVON TWP., LANCASTER COUNTY
Critical stream flooding and soil washoff problems in major flood events. Caused by uncontrolled runoff from upstream municipalities and obstructions in the system that need to be removed.

Results in damage to private property.

HONEYBROOK TWP., CHESTER COUNTY
Severe stream flooding, critical street flooding and soil washoff problems.

NEW HOLLAND BORO., LANCASTER COUNTY
Some storm water flow problems are created in major flood events when Norfolk Southern does not properly maintain its cross street piping and swales. There are some areas where storm pipes should be replaced - this will be done when street work is done. Damage is done when storm water flows into the sanitary sewer system.

Little Conestoga Watershed Questionnaire Results (conducted pre-1997)

1. Marietta Ave. at Little Conestoga - floods 2 - 3 times annually
2. Erosion along Millers Run - also water volume and frequency of flooding. Reported by local residents.
3. Erosion along Brubaker Run - also water volume and frequency of flooding. Reported by local residents.
4. Intersection of Steel Way and Manheim Pike - floods frequently
5. Railroad arch southwest of Loop Road - water frequently backs up behind it
6. Flooding at culvert along School House Road
7. West Roseville Road bridge
8. Shreiner Station Road covered bridge (Landis Mill Covered Bridge)
9. Shreiner Station Road concrete bridge
10. Rohrerstown Road
11. Buch Avenue
12. Flory's Mill structure
13. Alumax, Lancaster Dodge, and railroad constriction on a tributary of the
14. Little Conestoga Creek Charlestown Road at Manor Township Community Park
15. Hershey Mill Road
16. Bender Road
17. Route 462 at East end of Mountville Borough.
18. Sheet flow of water across Millport Road.

APPENDIX B

Act 167 Stormwater Management Plan Requirements and How They Are Satisfied by *Blueprints: An Integrated Water Resources Plan for Lancaster County (Act 247 and 167)*

Section 5(b)(1) – A survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development.

Existing runoff characteristics are described in the Act 167 Stormwater Management Plan Technical Report for Lancaster County (July, 2007) which is incorporated here by reference. According to the 2007 Technical Report, with good (modern) agricultural practices, after a watershed reaches 4% impervious coverage, the peak flows will approximately equal the post settlement conditions at the point where the original forests were cleared. At about 7% impervious cover the watershed will be subjected to peak flows equal to the highest levels of the 1930s and 1940s before the Soil Conservation Act, at which time there were mill ponds to trap sediment, and that anything above 7% impervious cover will subject the watershed to peak flows higher than any previously seen in the watershed (and with fewer and fewer mill ponds remaining). Refer to the Soil Survey of Lancaster County Pennsylvania (1982) and TR-55 for more detailed information.

Section 5(b)(2) – A survey of existing significant obstructions and their capacities.

There are no known significant obstructions from a countywide planning perspective.

Section 5(b)(3) – An assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity and quality.

Projected growth patterns in Lancaster County are established in *Balance, The Growth Management Element of the County's Comprehensive Plan,* which calls for 85% of future growth to occur within designated Urban Growth Areas which make up 16% of the entire County. The remaining 15% of growth is expected to occur outside of Urban Growth Areas. Rural growth will be guided to designated Rural Centers, including Villages, Crossroads Communities, Rural Business Areas and Rural Neighborhoods. The application of smart growth principles will help protect, conserve and improve water resources.

The need to accommodate 85% of future growth on 16% of the land in the County was one of the drivers of *Blueprints.* The IWRP acknowledges the benefits of green infrastructure oriented stormwater management BMPs and non-structural BMPs.

Because projected growth patterns have been established in the County Comprehensive Plan, an assessment of alternative land development patterns was not conducted in the preparation of this Plan.

Section 5(b)(4) – An analysis of present and projected development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff.

The countywide Flood Insurance Study (FIS), published by the Federal Emergency Management Agency in April 2005, investigates the existence and severity of flood hazards in, or revises and updates previous FISs/ Flood Insurance Rate Maps (FIRMs) for the geographic area of Lancaster County, including: the Boroughs of Adamstown, Akron,

Christiana, Columbia, Denver, East Petersburg, Elizabethtown, Ephrata, Lititz, Manheim, Marietta, Millersville, Mount Joy, Mountville, New Holland, Quarryville, Strasburg; the City of Lancaster; and the Townships of Bart, Brecknock, Caernarvon, Clay, Colerain, Conestoga, Conoy, Drumore, Earl, East Cocalico, East Donegal, East Drumore, East Earl, East Hempfield, East Lampeter, Eden, Elizabeth, Ephrata, Fulton, Lancaster, Leacock, Little Britain, Manheim, Manor, Martic, Mount Joy, Paradise, Penn, Pequea, Providence, Rapho, Sadsbury, Salisbury, Strasburg, Upper Leacock, Warwick, West Cocalico, West Donegal, West Earl, West Hempfield, West Lampeter. The Boroughs of Terre Hill and New Holland are non-floodprone.

Section 2.3 of the FIS indicates that major flooding is not a widespread or frequent problem. It goes on to say that "the lack of severe flooding conditions in most of the county is attributable to the physical features of the watersheds and stream channels. Of equal importance is the fact that local residents have generally not attempted to develop the low-lying stream banks and floodplains." There are no known developments proposed in flood hazard areas.

The municipal requirement to adopt a stormwater ordinance upon approval of this Plan will help ensure that flood damage will not be compounded in the future. Retrofitting inadequate facilities and solving existing problems will need to be the focus in the future.

Section 5(b)(5) – A survey of existing drainage problems and proposed solutions.

Existing drainage problems were identified in the previously adopted Act 167 Plans for the following watersheds: Mill Creek (1996), Little Conestoga Creek (1997), Cocalico Creek (2002), Conestoga River (2005). Municipal surveys were also conducted in the Chiques, Little Chiques and Donegal watersheds. A list of drainage problems in those watersheds is included in **Appendix A.** Proposed solutions are addressed in *Blueprints,* **Chapter 3** and include increasing tree canopy to reduce stormwater runoff, incorporating green infrastructure into capital and maintenance projects and implementing stormwater retrofit demonstration projects at known problem areas.

Section 5(b)(6) – A review of existing and proposed storm water collection systems and their impacts.

Based on information gathered and responses to municipal surveys, there are no existing or proposed countywide stormwater collection systems.

Section 5(b)(7) – An assessment of alternative runoff control techniques and their efficiency in the particular watershed.

Communities in Lancaster County have generally relied on traditional stormwater management systems, comprised primarily of a series of inlets, pipes, and basins. Green infrastructure systems afford greater benefits in terms of managing stormwater at its source, improving water quality, and enhancing our communities. Therefore, *Blueprints* encourages Low Impact Development (non-structural BMPs) and green infrastructure as the primary means of stormwater management. Grey infrastructure will continue to play a vital role in protecting the health, safety and welfare of our communities.

Section 5(b)(8) – An identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities.

Information on existing flood control projects can be found in previously adopted Act 167

Plans. There are no known State, Federal or local flood control projects proposed.

Section 5(b)(9) – A designation of those areas to be served by storm water collection and control facilities within a ten-year period, and estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction and operation of such facilities, and an identification of the existing or proposed institutional arrangements to implement and operate the facilities.

Balance, The Growth Management Element of Lancaster County's Comprehensive Plan, calls for Urban Growth Areas to be fully served by public facilities, including stormwater management facilities. *Blueprints* calls for the construction of stormwater BMP demonstration sites throughout the County and encourages regional stormwater management planning. *Blueprints* indicates the need for coordination and capitalization of opportunities to achieve stormwater and water quality improvements through existing sources of funds and in existing Capital Improvement Projects.

Section 5(b)(10) – An identification of flood plains within the watershed.

The Floodplain Insurance Study published by Federal Emergency Management Agency (2005) includes revised and updated Flood Insurance Rate Maps (FIRMs) for Lancaster County. Floodplain mapping is also available though the Lancaster County GIS, a division of the Lancaster County Information Technology Department.

Section 5(b)(11) – Criteria and standards for the control of storm water runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of this act.

Criteria and standards for the control of storm water runoff from new developments are identified in the Lancaster County Model Stormwater Management Ordinance. Minimum performance standards are outlined in **Chapter 6.** *Blueprints* provides direction for control of storm water runoff from existing sites, including the development of regional stormwater management plans, and stormwater BMP demonstration sites. *Blueprints* also recommends that communities set local tree canopy targets and develop action plans to achieve the desired goal.

Section 5(b)(12) – Priorities for implementation of action within each plan.

Chapter 3 of *Blueprints* identifies objectives and strategies that will help protect, conserve and restore surface and groundwater resources. Target dates for completion have been established for each individual action in the plan.

Section 5(b)(13) – Provisions for periodically reviewing, revising and updating the plan.

Blueprints is an element of the Lancaster County Comprehensive Plan as well as a countywide Act 167 Stormwater Management Plan. The Pennsylvania Municipalities Planning Code (MPC) in Section 301(c) indicates that Comprehensive Plans shall be reviewed at least every ten years. Act 167 requires the review and revision of the County's watershed stormwater plan "at least every five years." Therefore, the County will review the stormwater plan components of *Blueprints* at least every five years to be in compliance with Act 167 and the entire plan will be reviewed at least every ten years.

The Forum called for in Strategy 1 will play a key role in facilitating implementation of *Blueprints* and identifying issues that may need to be addressed by a revision.

Section 5(c)(1) – Provisions for managing stormwater.

Blueprints contains a Model Stormwater Management Ordinance which contains such provisions as are reasonably necessary to manage storm water such that development or activities in each municipality within the County do not adversely affect health, safety and property in other municipalities within the County and in basins to which the watershed is tributary. The Model Stormwater Ordinance (LCPC, 2012) described in Chapter 6, is incorporated herein by reference.

Section 5(c)(2) – Consistency with other environmental and land use plans.

Blueprints was developed as an integrated water resources plan and as such is consistent with existing municipal, county, regional and State environmental and land use plans.

LANCASTER COUNTY
MODEL STORMWATER MANAGEMENT ORDINANCE
October 2013

This Model Stormwater Management Ordinance is intended to implement the Act 167 Stormwater Management elements contained in Blueprints: An Integrated Water Resources Plan for Lancaster County (Act 247 and 167). It is based in part on Pennsylvania Department of Environmental Protection's (PADEP's) September 27, 2011 draft Model Stormwater Management Ordinance as well as input provided by stakeholders involved in the development of Blueprints and the County's Act 167 Plan Advisory Committee.

The Model Ordinance establishes performance standards and criteria consistent with the goals and objectives of Blueprints, of which this ordinance is a part.

Within six months following adoption by the Lancaster County Board of Commissioners and approval by the Pennsylvania Department of Environmental Protection (PADEP), each municipality within Lancaster County must adopt or amend and implement ordinances to regulate development in a manner consistent with the Act 167 elements of Blueprints.

A municipality may choose to adopt a stand-alone stormwater ordinance, which can be incorporated by reference in other municipal ordinances (the preferred approach), or incorporate the necessary standards into existing ordinances. Further, a municipality may enact additional and/or more stringent regulations, e.g. detailed design criteria. Additional regulatory provisions are acceptable only if such provisions neither conflict with, nor subvert, the goals and objectives articulated in Blueprints and the standards and criteria contained in this Model Ordinance.

Notes appear throughout the Model Ordinance indicating sections that require completion by the municipality. In some instances the completion of such information may require consultation with the municipal solicitor and/or engineer.

ORDINANCE NO. _____

_____ LANCASTER COUNTY, PENNSYLVANIA

[Name of Municipality]

Adopted at a Public Meeting Held on

_____, 20___

LCPC _____/_____/2013

TABLE OF CONTENTS

ARTICLE I
GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "_____ (Name of Municipality) Stormwater Management (SWM) Ordinance."

Section 102. Statement of Findings

The governing body of the Municipality finds that:

A. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of existing streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.

B. A comprehensive program of SWM, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, welfare, and the protection of the people of the Municipality and all the people of the Commonwealth, their resources, and the environment.

C. Stormwater is an important water resource, which provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

D. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their Municipal Separate Storm Sewer Systems (MS4) under the National Pollutant Discharge Elimination System (NPDES).

E. Riparian forest buffers enhance water quality by filtering pollutants in runoff, providing light control and temperature moderation, processing pollutants, increasing infiltration and providing channel and shoreline stability thus decreasing erosion (DEP Riparian Forest Buffer Guidance, November 27, 2010).

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance through provisions designed to:

A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code

Chapter 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.

B. Preserve the natural drainage systems as much as practicable.

C. Manage stormwater runoff close to the source.

D. Provide procedures and performance standards for stormwater planning and management.

E. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

F. Prevent scour and erosion of stream banks and streambeds.

G. Provide proper Operation and Maintenance of all Stormwater Management Best Management Practices (SWM BMPs) that are implemented within the Municipality.

H. Provide standards to meet NPDES permit requirements.

I. Promote stormwater runoff prevention through the use of nonstructural Best Management Practices (BMPs).

J. Provide a regulatory environment that supports the proportion, density and intensity of development called for in the comprehensive plan; allow for creative methods of improving water quality and managing stormwater runoff; and promote a regional approach to water resource management.

K. Help preserve and protect exceptional natural resources, and conserve and restore natural resource systems.

L. Promote stormwater management practices that emphasize infiltration, evaporation, and transpiration.

Section 104. Statutory Authority

A. Primary Authority:

The Municipality is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the "Stormwater Management Act" and Act 394 of 1937, as amended, 35 P.S. Section 691.1 et seq. the Pennsylvania Clean Streams Law. The municipality also is empowered to regulate land use activities that affect stormwater impacts by the authority of the *(cite relevant sections of the applicable municipal code (e.g. 53 P.S. §§ 55101 et seq. – First Class Township Code)).*

B. Secondary Authority:

The municipality also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

Section 105. Applicability

The provisions, regulations, limitations, and restrictions of this ordinance shall apply to regulated activities, as defined in this Ordinance.

Section 106. Repealer

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

~ OR ~

Section 106. Repeals and Continuation of Prior Regulations.

A. Except as otherwise required by law, this Ordinance is intended as a continuation of, and not a repeal of, existing regulations governing the subject matter. To the extent that this Ordinance restates regulations contained in ordinances previously enacted by the [Governing Body], this Ordinance shall be considered a restatement and not a repeal of such regulations. It is the specific intent of the [Governing Body] that all provisions of this Ordinance shall be considered in full force and effect as of the date such regulations were initially enacted. All ordinances or parts of ordinances inconsistent with the provisions of this Ordinance are hereby repealed. It is expressly provided that the provisions of this Ordinance shall not affect any act done, contract executed or liability incurred prior to its effective date, or affect any suit or prosecution pending or to be instituted to enforce any rights, rule, regulation or ordinance, or part thereof, or to punish any violation which occurred under any prior storm water regulation or ordinance. In the event any violation has occurred under any prior storm water regulation or ordinance of [Municipality], prosecution may be initiated against the alleged offender pursuant to the provisions of said prior storm water regulation or ordinance, and the provisions and penalties provided in said prior stormwater regulation or ordinance shall remain effective as to said violation.

B. Any Plan (hereinafter defined) pending at the time of the effective date of this Ordinance shall be allowed to proceed with revisions, finalization and implementation in accordance with any Ordinance in effect prior hereto. Any Subdivision and Land Development Plan filed pursuant to the provisions of the Pennsylvania Municipalities Planning Code where there isn't a prior storm water management ordinance in effect may proceed with development in accordance with the filing at the time of the effective date of this Ordinance.

Section 107. Severability

Should any section, provision or part thereof of this Ordinance be declared invalid by a court of

competent jurisdiction, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 108. Compatibility with Other Ordinance Requirements

Approvals issued pursuant to this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance.

Section 109. Erroneous Permit

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the Municipality purporting to validate such a violation.

Section 110. Municipal Liability

Except as specifically provided by the Pennsylvania Storm Water Management Act, Act of October 4, 1978, P.L. 864, No. 167, as amended, 32 P.S. §680.1 et seq., the making of any administrative decision by the [Municipality] or any of its officials or employees shall not constitute a representation, guarantee or warranty of any kind by the [Municipality] of the practicability or safety of any proposed structure or use with respect to damage from erosion, sedimentation, storm water runoff, flood, or any other matter, and shall create no liability upon or give rise to any cause of action against the [Municipality] and its officials and employees. [Municipality], by enacting and amending this Ordinance, does not waive or limit any immunity granted to the [Municipality] and its officials and employees by the Governmental Immunity Act, 42 Pa. C.S. §8541 et seq., and does not assume any liabilities or obligations

Section 111. Duty of Persons Engaged in the Development of Land

Notwithstanding any provision(s) of this Ordinance, including exemptions, any landowner or any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety, or other property. Such measures also shall include actions as are required to manage the rate, volume, direction, and quality of resulting stormwater runoff in a manner which otherwise adequately protects health, property, and water quality.

Section 112. Financial security

A. A financial security (bond, restricted account or letter of credit) for stormwater related improvements shall be supplied by the Developer in conjunction with the subdivision/land development approval, or in conjunction with the SWM Site Plan approval if no subdivision/land development plan is required.

B. The applicant shall provide a financial security to the Municipality for the timely installation and proper construction of all SWM facilities, including E&S BMPS, as required by the approved SWM Site Plan and this ordinance and, as applicable, in accordance with the provisions of Sections 509, 510, and 511 of the MPC.

C. As the work of installing the required SWM Facilities proceeds, the party posting the financial security may request the Governing Body to release or authorize the release, from time to time, such portions of the financial security necessary for payment to the contractor or contractors performing the work. Any such requests shall be in writing addressed to the Governing Body, and the Governing Body shall have 45 days from receipt of such request within which to allow the Municipal Engineer to certify, in writing, to the Governing Body that such portion of the work upon the SWM Facilities has been completed in accordance with the approved SWM Site Plan. Upon such certification the Governing Body shall authorize release by the bonding company or lending institution of an amount as estimated by the Municipal Engineer fairly representing the value of the SWM Facilities completed. The Governing Body may, prior to final release at the time of completion and certification by its Engineer, require retention of 10% of the estimated cost of the aforesaid SWM Facilities.

D. In the event that any SWM Facilities which may be required have not been installed as provided in the approved SWM Site Plan the Governing Body of the Municipality is hereby granted the power to enforce any corporate bond, or other security by appropriate legal and equitable remedies. If proceeds of such bond, or other security are insufficient to pay the cost of installing or making repairs or corrections to all the SWM Facilities covered by said security, the Governing Body of the Municipality may, at its option, install part of such SWM Facilities and may institute appropriate legal or equitable action to recover the monies necessary to complete the remainder of the SWM Facilities. All of the proceeds, whether resulting from the security or from any legal or equitable action brought against the Developer, or both, shall be used solely for the installation of the SWM Facilities covered by such security, and not for any other Municipal purpose

ARTICLE II
DEFINITIONS OF TERMS

Section 201. Interpretation and Word Usage

The language set forth in the text of this Ordinance shall be interpreted in accordance with the following rules of construction:

A. Words used or defined in one tense or form shall include other tenses or derivative forms.

B. Words in the singular number shall include the plural number, and words in the plural number shall include the singular number.

C. The masculine gender shall include the feminine and neuter. The feminine gender shall include the masculine and neuter. The neuter gender shall include the masculine and feminine.

D. The word "person" includes individuals, firms, partnerships, joint ventures, trusts, trustees, estates, corporations, associations and any other similar entities.

E. The word "Lot" includes the words "plot", "Tract", and "Parcel".

F. The words "shall," "must" and "will" are mandatory in nature and establish an obligation or duty to comply with the particular provision. The words "may" and "should" are permissive.

G. The time, within which any act required by this Ordinance is to be performed, shall be computed by excluding the first day and including the last day. However, if the last day is a Saturday or Sunday or a holiday declared by the United States Congress or the Pennsylvania General Assembly, it shall also be excluded. The word "day" shall mean a calendar day, unless otherwise indicated.

H. Any words not defined in this Ordinance or in Section 107 of the MPC shall be construed as defined in standard dictionary usage.

I. References to officially adopted regulations, standar ds, or publications of DEP or other governmental agencies shall include the regulation, publication, or standard in effect on the date when a SWM Site Plan is first filed. It is the intent of the (Governing Body) in enacting this Section to incorporate such changes to statutes, regulations, and publications to the extent authorized by 1 Pa. C.S. § 1937

Section 202. Definitions of Terms

(The Municipality should review definitions and amend as necessary to ensure consistency with any pertinent regulations, e.g. floodplain management)

Accelerated Erosion. The removal of the surface of the land through the combined action of man's activity and the natural processes at a rate greater than would occur because of the natural process alone.

Access Easement. A right granted by a landowner to a grantee, allowing entry for the purpose of inspecting, maintaining and repairing SWM Facilities.

Act 167 Plan. A plan prepared under the authority of Pennsylvania's Stormwater Management Act of October 4, 1978.

Agricultural Activity. Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops and raising livestock including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops, or pasturing and raising of livestock and installation of Conservation Practices. Construction of new buildings or impervious areas is not considered an agricultural activity.

Alteration. As applied to land, a change in topography as a result of the moving of soil and rock from

one location or position to another; also the changing of surface conditions by causing the surface to be more or less impervious; earth disturbance activity.

Animal Heavy Use Areas. A barnyard, feedlot, loafing area, exercise lot, or other similar area on an agricultural operation where due to the concentration of animals, it is not possible to establish and maintain vegetative cover of a density capable of minimizing accelerated erosion and sedimentation by usual planting methods. The term does not include entrances, pathways and walkways between areas where animals are housed or kept in concentration.

Applicant. A Landowner and/or Developer, as hereinafter defined, including his heirs, successors and assigns, who has filed an application to the municipality for approval to engage in any regulated activity at a Development Site located within the municipality.

BMP (Best Management Practice). Activities, facilities, control measures, planning or procedures used to minimize accelerated erosion and sedimentation and manage stormwater to protect, maintain, reclaim, and restore the quality of waters and the existing and designated uses of waters within this Commonwealth before, during and after earth disturbance activities[1]. *See also* Non-structural BMP and Structural BMP.

BMP Manual. The Pennsylvania Stormwater Best Management Practices Manual of December 2006, or most recent version thereof.

Building. Any enclosed or open structure, other than a boundary wall or fence, occupying more than four (4) square feet of area and/or having a roof supported by columns, piers, or walls.

Carbonate Geology. Limestone or dolomite bedrock. Carbonate geology is often associated with karst topography.

Certificate of Completion. Documentation verifying that all permanent SWM facilities have been constructed according to the plans and specifications and approved revisions thereto.

Chapter 102. 25 Pa. Code Chapter 102, Erosion and Sediment Control

Chapter 105. 25 Pa. Code, Chapter 105, Dam Safety and Waterway Management

Chapter 106. 25 Pa. Code, Chapter 106, Floodplain Management

Cistern. A reservoir or tank for storing rainwater.

Clean Water Act. the 1972 Amendments to the Federal Water Pollution Control Act, P.L. 92-500 of 1972, 33 U.S.C. §1251 et seq.

Conservation Plan. A plan written by an NRCS certified planner that identifies Conservation Practices and includes site specific BMPs for agricultural plowing or tilling activities and Animal Heavy Use Areas.

Conservation Practices. Practices installed on agricultural lands to improve farmland, soil and/or water quality which have been identified in a current Conservation Plan.

Conveyance. (n) Any structure that carries a flow. (v) The ability of a pipe, culvert, swale or similar facility to carry the peak flow from the design storm.

Culvert. A structure with appurtenant works which can convey a stream under or through an embankment or fill.

DEP *also* **PA DEP** *or* **PADEP.** The Pennsylvania Department of Environmental Protection or any agency successor to the Pennsylvania Department of Environmental Protection.

Design Storm. The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24-hours), used in the design and evaluation of SWM systems.

Detention Basin. An impoundment structure designed to manage stormwater runoff by temporarily storing the runoff and releasing it at a controlled rate.

Developer. A person who undertakes any Regulated Activity of this Ordinance.

Development Site (Site). The specific area of land where regulated activities in the municipality are planned, conducted or maintained.

Disappearing Stream. A stream in an area underlain by limestone or dolomite that flows underground for a portion of its length.

Disturbed Area. An land area where an earth disturbance activity is occurring or has occurred.

Drainage Easement. Rights to occupy and use another person's real property for the installation and operation of stormwater management facilities, or for the maintenance of natural drainageways to preserve and maintain a channel for the flow of stormwater therein, or to safeguard health, safety, property, and facilities

E&S. Erosion and Sediment.

E&S Plan (*also* **Erosion and Sediment Control Plan).** A site-specific plan consisting of both drawings and a narrative that identifies BMPs to minimize accelerated erosion and sedimentation before, during and after earth disturbance activities.

Earth Disturbance Activity. A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; land development; agricultural plowing or tilling; operation of animal heavy use areas; timber harvesting activities; road maintenance activities; oil and gas activities; well drilling; mineral extraction; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth mate-

rials[1].

Environmentally Sensitive Area. slopes greater than 15% percent, shallow bedrock (located within 6 feet of ground surface[2]), wetlands, Natural Heritage Areas and other areas designated as Conservation or Preservation in ***Greenscapes, the Green Infrastructure Element of the County Comprehensive Plan***, where encroachment by land development or land disturbance results in degradation of the natural resource.

Erosion. The natural process by which the surface of the land is worn away by water, wind, or chemical action. *See also,* "Accelerated Erosion" as defined above.

Existing Conditions. The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

FEMA. the Federal Emergency Management Agency.

Flood. A general but temporary condition of partial or complete inundation of normally dry land areas from the overflow of streams, rivers, and other waters of this Commonwealth.

Flood Fringe. That portion of the floodplain outside of the floodway[3].

Floodplain. Any land area susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary - Mapped as being a special flood hazard area. Also, the area of inundation that functions as a storage or holding area for floodwater to a width required to contain a base flood of which there is a one percent (1%) chance of occurrence in any given year. The floodplain contains both the floodway and the flood fringe.

Floodplain Management Act. Act of October 4, 1978, P.L. 851, No. 166, as amended 32 P.S. Section 679.101 et seq.

Floodway. That portion of the floodplain which is effective in carrying flow, within which this carrying capacity must be preserved and where the flood hazard is generally highest, i.e., where water depths and velocities are the greatest. It is that area which provides for the discharge of the base flood so the cumulative increase in water surface elevation is no more than one foot[3].

Alternative Definition from 25 Pa Code Chapter 105:
Floodway. The channel of the watercourse and those portions of the adjoining floodplains which are reasonably required to carry and discharge the 100-year frequency flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year frequency floodway, it is assumed – absent evidence to the contrary – that the floodway extends from the stream to 50 feet from the top of the bank of the stream[4].

Forest Management/Timber Operations. Planning and activities necessary for the management

of forest land. These include conducting a timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation and reforestation.

Frequency. The probability or chance that a given storm event/flood will be equaled or exceeded in a given year.

Grade. (n) A slope, usually of a road, channel or natural ground specified in percent and shown on plans as specified herein. (v) to finish the surface of a roadbed, top of embankment or bottom of excavation.

Groundwater Recharge. The process by which water from above the ground surface is added to the saturated zone of an aquifer, either directly or indirectly.

Hydrologic Soil Group (HSG). Refers to soils grouped according to their runoff-producing characteristics by NRCS. There are four (4) runoff potential groups ranging from A to D.

A. (Low runoff potential) Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission (greater than 0.30 inches/hour).

B. Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well-to-well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (from 0.15 to 0.30 inches/hour).

C. Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission (from 0.05 to 0.15 inches/hour).

D. (High runoff potential) Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission (from 0 to 0.05 inches/hour).

Impervious Surface (Impervious Area). Surfaces which prevent the infiltration of water into the ground. All structures, buildings, parking areas, driveways, roads, streets, sidewalks, decks, and any areas of concrete, asphalt, packed stone, and compacted soil shall be considered impervious surface if they prevent infiltration.

Impoundment. A retention or detention facility designed to retain stormwater runoff and infiltrate it into the ground (in the case of a retention basin) or release it at a controlled rate (in the case of a detention basin).

Infiltration Structures. A structure designed to direct runoff into the ground (e.g. french drains, seepage pits, seepage trench, rain gardens, vegetated swales, pervious paving, infiltration basins, etc.).

Inlet. A surface connection to a closed drain. The upstream end of any structure through which water may flow.

Intermittent. A natural, transient body or conveyance of water that exists for a relatively long time, but for weeks or months of the year is below the local water table and obtains its flow from both surface runoff and groundwater discharges.

Invasive Vegetation (Invasives). Plants which grow quickly and aggressively, spreading, and displacing other plants. Invasives typically are introduced into a region far from their native habitat. *See* ***Invasive Plants in Pennsylvania*** by the Department of Conservation and Natural Resources.

Karst. A type of topography or landscape characterized by features including but not limited to surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

Land Development. Any of the following activities:

1. The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving::

    a. A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or

    b. The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features.

2. Any subdivision of land.

3. Development in accordance with Section 503(1.1) of the Pennsylvania Municipalities Planning Code.

Landowner. The legal or beneficial owner or owners of land including the holder of an option or contract to purchase (whether or not such option or contract is subject to any condition), a lessee if he is authorized under the lease to exercise the rights of the landowner, or other person having a proprietary interest in land.

Limiting Zone. A rock formation, other stratum, or soil condition which is so slowly permeable that it effectively limits downward passage of effluent[12]. Season high water tables, whether perched or regional also constitute a limiting zone.

Lineament. A linear feature in a landscape which is an expression of an underlying geological structure such as a fault.

Manning's Equation. An equation for calculation of velocity of flow (e.g. feet per second) and flow rate (e.g. cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. Manning's Equation assumes steady, gradually varied flow.

Maximum Extent Practicable (MEP). Applies when the applicant demonstrates to the Municipality's satisfaction that the performance standard is not achievable. The applicant shall take into account the best available technology, cost effectiveness, geographic features, and other competing interests such as protection of human safety and welfare, protection of endangered and threatened resources, and preservation of historic properties in making the assertion that the performance standard cannot be met and that a different means of control is appropriate.[5]

MPC. The Pennsylvania Municipalities Planning Code, Act of 1968, P.L. 805, No. 247, as reenacted and amended, 53 P.S. Section 10101 et seq.

Municipal Separate Storm Sewer System (MS4). All separate storm sewers that are defined as "large" or "medium" or "small" municipal separate storm sewer systems pursuant to 40 CFR §§ 122.26(b)(18), or designated as regulated under 40 CFR §122.26(a)(1)(v).

Municipality. The [Borough, City, or Township] of [Name of Municipality], Lancaster County, Pennsylvania.

NRCS. Natural Resources Conservation Service (previously Soil Conservation Service, or SCS).

National Pollution Discharge Elimination System (NPDES). A permit issued under 25 Pa. Code Chapter 92a (relating to National Pollutant Discharge Elimination System permitting, monitoring and compliance) for the discharge or potential discharge of pollutants from a point source to surface waters.

Native Vegetation. Plant species that have evolved or are indigenous to a specific geographical area. These plants are adapted to local soil and weather conditions as well as pests and diseases.

Natural Drainageway. An existing channel for water runoff that was formed by natural processes.

Natural Ground Cover. Ground cover which mimics the infiltration characteristics of predominant hydrologic soil group found at the site.

Nonpoint Source Pollution. Any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act.

Non-structural BMPs. Planning and design approaches, operational and/or behavior-related practices which minimize stormwater runoff generation resulting from an alteration of the land surface or limit contact of pollutants with stormwater runoff.

Open Channel. A drainage element in which stormwater flows with an open surface. Open channels include, but shall not be limited to, natural and man-made drainage ways, swales, streams, ditches, canals, and pipes flowing partly full. Open channels may include closed conduits so long as the flow is not under pressure.

Outfall. Point where water flows from a conduit, stream, pipe, or drain.

Peak Discharge. The maximum rate of stormwater runoff from a specific storm event.

PennDOT. The Pennsylvania Department of Transportation or any agency successor thereto.

Pervious Area. Any material / surface that allows water to pass through at a rate equal to or greater than Natural Ground Cover.

Pipe. A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

Plans. The SWM and erosion and sediment control plans and narratives.

Planning Commission. The planning commission of [Name of Municipality], Lancaster County, Pennsylvania.

Process Wastewater. Water that comes in contact with any raw material, product, by-product, or waste during any production or industrial process.

Qualified Person. Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Ordinance.

Rate Control. SWM controls used to manage the peak flows for the purposes of channel protection and flood mitigation,.

Rational Formula (Rational Method). A rainfall-runoff relation used to estimate peak flow.

Redevelopment. Any physical improvement to a previously developed lot that involves earthmoving, removal, or addition of impervious surfaces.

Regional Stormwater Management Plan. A plan to manage stormwater runoff from an area larger than a single Development Site. A Regional Stormwater Management Plan could include two adjacent parcels, an entire watershed, or some defined area in between. Regional Stormwater Management Plans can be prepared for new development, or as a retrofit to manage runoff from already developed areas.

Regulated Activities. Activities, including Earth Disturbance Activities that involve the alteration or development of land in a manner that may affect stormwater runoff. Regulated activities shall include, but not be limited to:

- Land Development subject to the requirements of the [name of municipality] Subdivision and Land Development Ordinance;
- Removal of ground cover, grading, filling or excavation;
- Construction of new or additional impervious or semi-impervious surfaces (driveways, parking lots, etc.), and associated improvements;
- Construction of new buildings or additions to existing buildings;
- Installation or alteration of stormwater management facilities and appurtenances thereto;
- Diversion or piping of any watercourse; and,
- Any other regulated activities where the Municipality determines that said activities may affect any existing watercourse's stormwater management facilities, or stormwater drainage patterns.

Release Rate. For a specific design storm or list of design storms, the percentage of peak flow rate for existing conditions which may not be exceeded for the proposed conditions.

Release Rate Map. A graphical representation of the release rates for a specific area.

Retention Basin. A Stormwater Management Facility that includes a permanent pool for water quality treatment and additional capacity above the permanent pool for temporary runoff storage.

Riparian. Pertaining to a stream, river or other watercourse. Also, plant communities occurring in association with any spring, lake, river, stream or creek through which waters flow at least periodically[6].

Riparian Buffer. A BMP that is an area of permanent vegetation along a watercourse.

Riparian Corridor. A narrow strip of land, centered on a stream or river that includes the floodplain as well as related riparian habitats adjacent to the floodplain[6].

Riparian Corridor Easement. An easement created for the purpose of protecting and preserving a Riparian Corridor.

Riparian Forest Buffer. A type of Riparian Buffer that consists of permanent vegetation that is predominantly native trees, shrubs and forbs along a watercourse that is maintained in a natural state or sustainably managed to protect and enhance water quality, stabilize stream channels and banks, and separate land use activities from surface waters.

Rooftop Detention. Temporary ponding and gradual release of stormwater falling directly onto roof surfaces by incorporating controlled-flow roof drains into building designs.

Runoff. Any part of precipitation that flows over the land surface.

SCS. U.S. Department of Agriculture, Soil Conservation Service (now known as NRCS).

Sediment. Soils or other materials transported by stormwater as a product of erosion[1].

Sediment Basin. A barrier, dam, retention or detention basin located and designed to retain rock,

sand, gravel, silt, or other material transported by water.

Sediment Pollution. The placement, discharge or any other introduction of sediment into the waters of the Commonwealth occurring from the failure to design, construct, implement or maintain control measures and control facilities in accordance with the requirements of this Ordinance.

Sedimentation. The action or process of forming or depositing sediment in Waters of this Commonwealth[1].

Seepage Pit/Seepage Trench. An area of excavated earth filled with loose stone or similar coarse material, into which surface water is directed for infiltration into the ground.

Semi-impervious / Semi-pervious surface. A surface which prevents some infiltration of water into the ground.

Sheet Flow. Runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel.

Small Project. Regulated activities that, measured on a cumulative basis from *(the date of enactment of this Ordinance or other date as determined by the municipality)*, create new impervious areas of more than 1,000 sq.ft. and less than (municipality to select limit between 2,000 and 5,000sq. ft.) or involve Earth Disturbance Activity of an area less than 5,000 sq. ft. and do not involve the alteration of stormwater facilities or watercourses.

Small Storm Event. A storm having a frequency of recurrence of once every two (2) years or smaller.

Soil-Cover Complex Method. A method of runoff computation developed by the SCS (now NRCS) that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN). For more information, see "Urban Hydrology for Small WATERSHEDS", Second edition, Technical Release No. 55, SCS, June 1986 (or most current edition).

Soil Group, Hydrologic. *See* "Hydrologic Soil Group".

State Water Quality Requirements. The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code, the Clean Streams Law and the Clean Water Act.

Storage. A volume above or below ground that is available to hold stormwater.

Storm event. A storm of a specific duration, intensity, and frequency[7].

Storm Sewer. A system of pipes and/or open channels designed to convey stormwater.

Stormwater. Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

Stormwater Management Act. Act of October 4, 1978, P.L. 864, No. 167, as amended 32 P.S. Section 680.1 et seq.

Stormwater Management Best Management Practices (SWM BMP). *See* BMPs.

Stormwater Management Facility (SWM Facility). Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, infiltrates/evaporates/transpires, cleans or otherwise affects stormwater runoff. Typical SWM facilities include, but are not limited to, detention and retention basins, open channels, watercourses, road gutters, swales, storm sewers, pipes, BMPs, and infiltration structures.

Stormwater Management Operation and Maintenance Plan (O & M Plan). A plan, including a narrative, to ensure proper functioning of the SWM facilities in accordance with Article VI of this Ordinance.

Stormwater Management Site Plan (SWM Site Plan). The Plan prepared by the Developer or his representative indicating how stormwater runoff will be managed at a particular development site according to this Ordinance.

Stream. A watercourse

Structural BMPs. Physical devices and practices that capture and treat stormwater runoff. Structural stormwater BMPs are permanent appurtenances to the Development Site.

Structure. Any man-made object having an ascertainable stationary location on or in land or water, whether or not affixed to the land [8].

Subdivision. The division or re-division of a single Lot, Tract or Parcel of land by any means into two (2) or more Lots, Tracts, Parcels or other divisions of land, including changes in existing Lot Lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devises, transfer of ownership, or Building, or Lot development. *or* As defined in the MPC.

Swale. A low lying stretch of land which gathers or carries surface water runoff.

SWM. Stormwater Management

SWM Site Plan. A Stormwater Management Site Plan.

Timber Operations. *See* Forest Management.

Time of Concentration (Tc). The time for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

Top of streambank. First substantial break in slope between the edge of the bed of the stream and

the surrounding terrain. The top of streambank can either be a natural or constructed (that is, road or railroad grade) feature, lying generally parallel to the watercourse.

Treatment Train. The sequencing of structural Best Management Practices to achieve optimal flow management and pollutant removal from urban stormwater.

USDA. United States Department of Agriculture.

Volume Control. SWM controls, or BMPs, used to remove a predetermined amount of runoff or the increase in volume between the pre- and post-development design storm.

Watercourse. A channel or conveyance of surface water having defined bed and banks, whether natural or artificial, with perennial or intermittent flow. Watershed - The entire region or area drained by a watercourse.

Watershed. The entire region or area drained by a watercourse.

Waters of this Commonwealth. Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of Pennsylvania.

Wetland. Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, ferns, and similar areas.

Woodland. Land predominantly covered with trees and shrubs. Without limiting the foregoing, Woodlands include all land areas of 10,000 square feet or greater, supporting at least 100 trees per acre, so that either (i) at least 50 trees are two inches or greater in [diameter at breast height] [(DBH)], or (ii) 50 trees are at least 12 feet in height.

ARTICLE III
STORMWATER MANAGEMENT STANDARDS

Section 301. General Requirements

A. Preparation of a SWM Site Plan is required for all regulated activities, unless preparation and submission of the SWM Site Plan is specifically exempted according to Section 502 or the activity qualifies as a Small Project.

B. No regulated activities shall commence until the municipality issues unconditional written approval of a SWM Site Plan or Stormwater Permit.

C. SWM Site Plans approved by the municipality, in accordance with Section 505, shall be on site throughout the duration of the regulated activity.

D. The municipality may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law. The municipality shall maintain a record of consultations with DEP pursuant to this paragraph. Where an NPDES permit for stormwater discharges associated with construction activities is required, issuance of an NPDES permit shall constitute satisfaction of consultation with DEP.

E. For all regulated activities, erosion and sediment control and stormwater management BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the ***Erosion and Sediment Pollution Control Program Manual*** (E&S Manual)[9], No. 363-2134-008 (March 2012), as amended and updated, and the BMP Manual.

F. Developers have the option to propose a Regional Stormwater Management Plan or participate in a Regional Stormwater Management Plan developed by others. A Regional Stormwater Management Plan may include offsite volume and rate control, as appropriate and supported by a detailed design approved by the Municipality in accordance with Section 301.D. A Regional Stormwater Management Plan must meet all of the volume and rate control standards required by this Ordinance for the area defined by the Regional Stormwater Management Plan, but not necessarily for each individual Development Site. Appropriate agreements must be established to ensure the requirements of this ordinance and the requirements of the Regional Stormwater Management Plan are met.

G. Unless prohibited by the [Name of Municipality] Zoning Ordinance or any Ordinance which regulates construction and development within the areas of the [Name of Municipality] subject to flooding, and any other applicable requirements of the Floodplain Management Act, stormwater management facilities located in the floodplain are permitted when designed and constructed in accordance with the provisions of the BMP Manual, regulatory requirements

and the requirements of this ordinance.

H. Impervious areas:

1. The measurement of impervious area shall include all of the impervious areas in the total proposed development even if development is to take place in stages or phases.

2. For development taking place in stages or phases, the entire development plan must be used in determining conformance with this Ordinance.

3. Any areas designed to initially be gravel or crushed stone shall be assumed to be impervious.

I. All regulated activities shall include such measures as necessary to:

1. Protect health, safety, and property;

2. Meet the water quality goals of this Ordinance by implementing measures to:

a. Protect and/or improve the function of floodplains, wetlands, and wooded areas.

b. Protect and/or improve native plant communities including those within the riparian corridor.

c. Protect and/or improve natural drainageways from erosion.

d. Minimize thermal impacts to waters of this Commonwealth.

e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

J. The design of all stormwater management facilities over karst shall include an evaluation of measures to minimize adverse effects.

K. Infiltration BMPs shall be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance. Infiltration BMPs shall include pretreatment BMPs unless shown to be unnecessary.

L. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and Development Site conditions and shall be constructed on soils that have the following characteristics:

1. A minimum depth of 24 inches between the bottom of the facility and the limiting zone, unless it is demonstrated to the satisfaction of the Municipality that the selected BMP has design criteria which allow for a smaller separation.

2. A stabilized infiltration rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Applicant's professional designer.

    a. The stabilized infiltration rate is to be determined in the same location and within the same soil horizon as the bottom of the infiltration facility.

    b. The stabilized infiltration rate is to be determined as specified in the BMP Manual.

M. The calculation methodology to be used in the analysis of volume and peak rates of discharge shall be as required in Section 305.

N. A planting plan is required for all vegetated stormwater BMPs.

1. Native or Naturalized/Non-invasive Vegetation suitable to the soil and hydrologic conditions of the Development Site shall be used unless otherwise specified in the BMP Manual.

2. Invasive Vegetation may not be included in any planting schedule. (*See **Invasive Plants in Pennsylvania*** by the Department of Conservation and Natural Resources (DCNR))

3. The limit of existing, native vegetation to remain shall be delineated on the plan along with proposed construction protection measures.

4. Prior to construction, a tree protection zone shall be delineated at the Dripline of the tree canopy. All trees scheduled to remain during construction shall be marked; however, where groups of trees exist, only the tress on the outside edge need to be marked. A 48 inch high snow fence or 48 inch high construction fence mounted on steel posts located 8 feet on center shall be placed along the tree protection boundary. No construction, storage of material, temporary parking, pollution of soil, or regrading shall occur within the tree protection zone.

5. All planting shall be performed in conformance with good nursery and landscape practice. Plant materials shall conform to the standards recommended by the American Association of Nurseryman, Inc. in the American Standard of Nursery Stock.

    a. Planting designs are encouraged to share planting space for optimal root growth whenever possible.

    b. No staking or wiring of trees shall be allowed without a maintenance note for the stake and/or wire removal within one year of planting.

(Municipalities who wish to include more specific requirements regarding the planting plan can refer to the County's Model SLDO Section 810.2.F for guidance.)

O. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity. Staging of earth-

moving activities and selection of construction equipment should consider this protection.

P. P. Infiltration BMPs shall not be constructed nor receive runoff from disturbed areas until the entire contributory drainage area to the infiltration BMP has achieved final stabilization.

Q. A minimum ten (10) foot wide access easement shall be provided for all stormwater facilities with tributary areas equal or greater than 1000 sq. ft. and not located within a public right-of-way. Easements shall provide for ingress and egress to a public right-of-way.

R. Drainage easements shall be provided where the conveyance, treatment, or storage of stormwater, either existing or proposed, is identified on the SWM Site Plan. Drainage easements shall be provided to contain and convey the 100-year frequency flood.

S. The Municipality may require additional stormwater control measures for stormwater discharges to special management areas including but not limited to:

1. Water bodies listed as "impaired" on Pennsylvania's Clean Water Act 303(d/305(b) Integrated List.

2. Any water body or watershed with an approved Total Maximum Daily Load (TMDL).

3. Critical areas with sensitive resources (e.g., state designated special protection waters, cold water fisheries, carbonate or other groundwater recharge areas highly vulnerable to contamination, drainage areas to water supply reservoirs, source water protection zones, etc.)

T. Roof drains and sump pumps shall be tributary to infiltration or vegetative BMPs. Use of catchment facilities for the purpose of reuse is also permitted.

U. Non-structural BMPs shall be utilized for all regulated activities unless proven to be impractical.

Section 302. Volume Controls

Volume control BMPs are intended to maintain existing hydrologic conditions for small storm events by promoting groundwater recharge and/or evapotranspiration as described in this section. Runoff volume controls shall be implemented using the Design Storm Method described in Subsection A below, or through continuous modeling approaches or other means as described in the BMP Manual. Small Projects may use the method described in Subsection B to design volume control BMPs.

A. The ***Design Storm Method*** is applicable to any size of regulated activity. This method requires detailed modeling based on site conditions.

1. Do not increase the post development total runoff volume for all storms equal to or less than the 2-year 24-hour storm event.

2. For modeling purposes:

a. Existing (predevelopment) non-forested pervious areas must be considered meadow in good condition.

b. When the existing project site contains impervious area, twenty percent (20%) of existing impervious area to be disturbed shall be considered meadow in good condition in the model for existing conditions.

c. The maximum loading ratio for volume control facilities in Karst areas shall be 3:1 impervious drainage area to infiltration area and 5:1 total drainage area to infiltration area. The maximum loading ratio for volume control facilities in non-Karst areas shall be 5:1 impervious drainage area to infiltration area and 8:1 total drainage area to infiltration area. A higher ratio may be approved by the municipality if justification is provided. Hydraulic depth may be used as an alternative to an area based loading ratio if the design hydraulic depth is shown to be less than the depth that could result from the maximum area loading ratio

B. Volume Control for Small Projects

1. At least the first one inch (1") of runoff from new impervious surfaces or an equivalent volume shall be permanently removed from the runoff flow – i.e. it shall not be released into the surface Waters of this Commonwealth. Removal options include reuse, evaporation, transpiration and infiltration.

C. A detailed geologic evaluation of the Development Site shall be performed in areas of carbonate geology to determine the design parameters of recharge facilities. A report shall be prepared in accordance with Section 405.A of this Ordinance.

D. Storage facilities, including normally dry, open top facilities, shall completely drain the volume control storage over a period of time not less than 24 hours and not more than 72 hours from the end of the design storm. Any designed infiltration at such facilities is exempt from the minimum 24 hour standard, i.e. may infiltrate in a shorter period of time, provided that none of this water will be discharged into Waters of this Commonwealth.

E. Any portion of the volume control storage that meets the following criteria may also be used as rate control storage;

1. Volume control storage that depends on infiltration is designed according to the infiltration standards in Section 301.

2. The volume control storage which will be used for rate control is that storage which is available within 24 hours from the end of the design storm based on the stabilized infiltration rate and/or the evapo-transpiration rate.

F. Volume control storage facilities designed to infiltrate shall avoid the least permeable Hydrologic Soil Group(s) at the Development Site.

Section 303. Rate Controls

Rate control for large storms, up to the 100-year event, is essential to protect against immediate downstream erosion and flooding.

A. Match Pre-development Hydrograph

Applicants shall provide infiltration facilities or utilize other techniques which will allow the post-development 100 year hydrograph to match the pre-development 100 year hydrograph, along all parts of the hydrograph, for the Development Site. To match the pre-development hydrograph, the post development peak rate must be less than or equal to the pre-development peak rate, and the post development runoff volume must be less than or equal to the pre-development volume for the same storm event. A shift in hydrograph peak time of up to five minutes and a rate variation of up to 5% at a given time may be allowable to account for the timing affect of BMPs used to manage the peak rate and runoff volume. "Volume Control" volumes as given in Section 302 above may be used as part of this option.

B. Where the pre-development hydrograph cannot be matched, one of the following shall apply:

1. For areas not covered by a release rate map from an approved Act 167 Plan:

Post development discharge rates shall not exceed the predevelopment discharge rates for the 2, 10, 25, 50, and 100-year 24-hour storm events*. If it is shown that the peak rates of discharge indicated by the post development analysis are less than or equal to the peak rates of discharge indicated by the predevelopment analysis for 2, 10, 25, 50, and 100-year, 24-hour storms*, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.

2. For areas covered by a release rate map from an approved Act 167 Plan:

For the 2, 10, 25, 50, and 100-year storm events*, the post development peak discharge rates will follow the applicable approved release rate maps.

C. Normally dry, open top, storage facilities shall completely drain the rate control storage over a period of time less than or equal to 24 hours from the peak 100 year water surface design elevation.

D. A variety of BMPs should be employed and tailored to suit the Development Site. The following is a partial listing of BMPs which can be utilized in SWM systems for rate control where appropriate:

1. Decreased impervious surface coverage

* A 24 hour SCS type II storm or an IDF Curve Rational Method storm. *See* Table III-1 in Section 305.

2. Routed flow over grass

3. Grassed channels and vegetated strips.

4. Bio-retention areas (rain gardens)

5. Concrete lattice block or permeable surfaces

6. Seepage pits, seepage trenches or other infiltration structures

7. Rooftop detention

8. Parking lot detention

9. Cisterns and underground reservoirs

10. Amended soils

11. Retention basins

12. Detention basins

13. Other methods as may be found in the BMP Manual.

E. Small Projects are not required to provide for Rate Control.

Section 304. Stormwater Management Performance Standards

A. Runoff from impervious areas shall be drained to pervious areas within the Development Site, unless the site has 85% or more impervious cover and is a Redevelopment10, in which case the portion of the site that discharges to pervious areas shall be maximized.

B. Stormwater runoff from a Development Site to an adjacent property shall flow directly into a natural drainageway, watercourse, or into an existing storm sewer system, or onto adjacent properties in a manner similar to the runoff characteristics of the pre-development flow.

C. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification of the adjacent property owner(s) by the developer. Such stormwater flows shall be subject to the requirements of this Ordinance, including the establishment of a drainage easement. Copies of all such notifications shall be included in SWM Site Plan submissions.

D. Existing on-site natural and man-made SWM facilities shall be used to the maximum extent practicable.

E. Stormwater runoff shall not be transferred from one sub-watershed to another unless they are sub-watersheds of a common watershed that join together within the perimeter of the Development Site and the effect of the transfer does not alter the peak discharge onto adjacent lands.

F. Minimum floor elevations for all structures that would be affected by a basin, other temporary impoundments, or open conveyance systems where ponding may occur shall be two (2) feet above the 100-year water surface elevation. If basement or underground facilities are proposed, detailed calculations addressing the effects of stormwater ponding on the structure and water-proofing and/or flood-proofing design information shall be submitted for approval.

G. All stormwater conveyance facilities (excluding detention, retention, and wetland basin outfall structures) shall be designed to convey a 25 year storm event**. All stormwater conveyance facilities (excluding detention, retention, and wetland basin outfall structures) conveying water originating from offsite shall be designed to convey a 50 year storm event*. Safe conveyance of the 100-year runoff event* to appropriate peak rate control BMPs must be demonstrated in the design.

H. Erosion protection shall be provided along all open channels, and at all points of discharge. Flow velocities from any storm sewer may not result in erosion of the receiving channel.

Section 305. Calculation Methodology

A. Any stormwater runoff calculations involving drainage areas greater than 200 acres and time of concentration (Tc) greater than 60 minutes, including on- and off-site areas, shall use generally accepted calculation techniques based on the NRCS soil-cover complex method.

TABLE III-1
ACCEPTABLE COMPUTATION METHODOLOGIES FOR STORMWATER MANAGEMENT PLANS

METHOD	METHOD DEVELOPED BY	APPLICABILITY
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary.
WinTR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.
HEC-1 / HEC-HMS	US Army Corps of Engineers	Applicable where use of full hydrologic computer model is desirable or necessary.
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For development sites less than 200 acres, Tc<60 min. or as approved by the Municipality.
EFH2	USDA NRCS	Applicable in rural and undeveloped areas subject to the Program Limits.
Other Methods	Varies	Other methodologies approved by the Municipality.

** A 24 hour SCS type II storm or an IDF Curve Rational Method storm. *See* Table III-1 in Section 305.

B. Stormwater runoff from all Development Sites shall be calculated using either the modified rational method, a soil-cover-complex methodology, or other method acceptable to the Municipality. **Table III-1** summarizes acceptable computation methods. It is assumed that all methods will be selected by the design professional based on the individual limitations and suitability of each method for a particular Development Site.

C. If the SCS method is used, Antecedent Moisture Condition 1 is to be used in areas of carbonate geology, and Antecedent Moisture Condition 2 is to be used in all other areas. A type II distribution shall be used in all areas.

D. If the Rational Method is used, the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 data (*See* item "B" above) or PennDOT Publication 584 "PennDOT Drainage Manual," 2008 Edition, or latest, shall be used to determine the rainfall intensity in inches per hour based on the information for the 5 through 60 minute duration storm events.

E. Hydrographs may be obtained from NRCS methods such as TR-55, TR20, or from use of the "modified" or "unit hydrograph" rational methods. If "modified" or "unit hydrograph" rational methods are used, the ascending leg of the hydrograph shall have a length equal to three times the time of concentration (3xTc) and the descending leg shall have a length equal to 7 times the time of concentration (7xTc) to approximate an SCS Type II hydrograph.[11]

F. Runoff calculations shall include a hydrologic and hydraulic analysis indicating volume and velocities of flow and the grades, sizes, and capacities of water carrying structures, sediment basins, retention and detention structures and sufficient design information to construct such facilities. Runoff calculations shall also indicate both pre-development and post-development rates for peak discharge of stormwater runoff from all discharge points.

G. For the purpose of calculating pre-development peak discharges, all runoff coefficients, both on-site and off-site, shall be based on actual land use assuming summer or good land conditions. Post-development runoff coefficients for off-site discharges used to design conveyance facilities shall be based on actual land use assuming winter or poor land conditions.

H. Criteria and assumptions to be used in the determination of stormwater runoff and design of management facilities are as follows:

1. Runoff coefficients shall be based on the information contained in **Appendix B-1** and **B-2** if the actual land use is listed in those Appendices. If the actual land use is not listed in these Appendices, runoff coefficients shall be chosen from other published documentation, and a copy of said documentation shall be submitted with the SWM Site Plan.

2. A sample worksheet for calculating Tc is provided in **Appendix B-4**. Times of concentration (Tc) shall be based on the following design parameters:

    a. Sheet flow: The maximum length for each reach of sheet or overland flow before shallow concentrated or open channel flow develops is one hundred fifty (150) feet.

Flow lengths greater than one hundred (100) feet shall be justified based on the actual conditions at each Development Site. Sheet flow may be determined using the nomograph in **Appendix B-3**, or the Manning's kinematic solution shown in the Sheet Flow section of Worksheet No. 1 in **Appendix B-4**.

b. Shallow concentrated flow: Travel time for shallow concentrated flow shall be determined using Figure 3-1 from TR-55, Urban Hydrology for small watersheds, as shown in Appendix B-5.

c. Open Channel flows: At points where sheet and shallow concentrated flows concentrate in field depressions, swales, gutters, curbs, or pipe collection systems, the travel times to downstream end of the Development Site between these design points shall be based upon Manning's Equation and/or acceptable engineering design standards as determined by the Municipal Engineer.

3. The developer may use stormwater credits for Non-Structural BMPs in accordance with the BMP Manual. The allowable reduction will be determined by the Municipality.

4. Peak rate control is not required for off-site runoff. Off-site runoff may be by-passed around the site provided all other discharge requirements are met. If offsite runoff is routed through rate control facilities, runoff coefficients for off-site discharges used to design those rate control facilities shall be based on actual land use assuming winter or poor land conditions.

I. Times of Concentration shall be calculated based on the methodology recommended in the respective model used. Times of Concentration for channel and pipe flow shall be computed using Manning's equation. Supporting documentation and calculations must be submitted for review and approval.

Section 306. Riparian Corridors

A. In order to protect and improve water quality, a Riparian Corridor Easement shall be created and recorded as part of any subdivision or land development that encompasses a Riparian Corridor.

B. Except as otherwise required by Chapter 102, the Riparian Corridor Easement shall be measured to be the greater of the limit of the 100 year floodplain or 35 feet from the top of streambank (on each side).

C. Minimum Management Requirements for Riparian Corridors.

1. Existing native vegetation shall be protected and maintained within the Riparian Corridor Easement.

2. Whenever practicable invasive vegetation shall be actively removed and the Riparian Corridor Easement shall be planted with native trees, shrubs and other vegetation to create a

diverse native plant community appropriate to the intended ecological context of the site.

D. The Riparian Corridor Easement shall be enforceable by the municipality and shall be recorded in the Lancaster County Recorder of Deeds Office, so that it shall run with the land and and shall limit the use of the property located therein. The easement shall allow for the continued private ownership and shall count toward the minimum lot area as required by Zoning, unless otherwise specified in the municipal Zoning Ordinance.

E. Any permitted use within the Riparian Corridor Easement shall be conducted in a manner that will maintain the extent of the existing one-hundred-year floodplain, improve or maintain the stream stability, and preserve and protect the ecological function of the floodplain.

F. The following conditions shall apply when public and/or private recreation trails are permitted within Riparian Corridors:

1. Trails shall be for non-motorized use only.

2. Trails shall be designed to have the least impact on native plant species and other sensitive environmental features.

G. Septic drainfields and sewage disposal systems shall not be permitted within the Riparian Corridor Easement and shall comply with setback requirements established under 25 Pa Code Chapter 73.

ARTICLE IV
INFORMATION TO BE INCLUDED ON OR WITH STORMWATER MANAGEMENT SITE PLANS

Section 401. General Plan Requirements

A. The SWM Site Plan shall consist of a narrative and all applicable calculations, maps, plans and supplemental information necessary to demonstrate compliance with this Ordinance.

B. All landowners of land included in the SWM Site Plan shall be required to execute all applications and final documents.

C. All SWM Site Plans shall be prepared by a Qualified Person.

D. Where the regulated activity constitutes subdivision or land development as hereinabove defined, the SWM Site Plan shall be submitted with and form an integral part of the plans required under the Municipal Subdivision and Land Development Ordinance.

Section 402. Drafting Standards

A. The Plan should be clearly and legibly drawn.

B. If the Plan is prepared in two (2) or more drawing sheets, a key map showing the location of the sheets and a match line shall be placed on each sheet.

C. Each sheet shall be numbered to show the relationship to the total number of sheets in the Plan (e.g. Sheet 1 of 5).

D. Drawings or maps of the project area shall be drawn at 1" = 50' or larger scale (i.e. 1" = 40', 1" = 30', etc.) and shall be submitted on 24-inch x 36-inch sheets.

E. SWM Site Plans shall be prepared in a form that meets the requirements for recording for the Office of the Recorder of Deeds of Lancaster County.

F. The total Development Site boundary and size with distances marked to the nearest foot and bearings to the nearest degree

Section 403. SWM Site Plan Information

The following items shall be included in the SWM Site Plan:

A. The date of the SWM Site Plan and latest revision, graphic scale, written scale and North arrow.

B. The name of the development, the name and address of the owner of the property, and the name of the individual or firm preparing the Plan.

C. The file or project number assigned by the firm that prepared the Plan.

D. A statement, signed by the landowner, acknowledging the SWM Facilities to be permanent fixtures that cannot be altered or removed unless a revised Plan is approved by the Municipality.

E. The following signature block for the municipality:

_____ (Name of Municipality) SWM Site Plan Approval Certification

At a meeting on _____, 20____, the _____ (Municipal Governing Body) approved this project, and all conditions have been met. This approval includes the complete set of plans and information that are filed with the Municipality in File No. _____, based upon its conformity with the standards of the _____ (Name of Municipality) Storm Water Management Ordinance.

_____ Governing Body Signature

_____ Governing Body Signature

F. For SWM facilities located off-site,

1. A note on the Plan referencing a recorded Stormwater Operation and Maintenance (O&M) Agreement that indicates the location and responsibility for maintenance of the off-site facilities.

2. All off-site SWM Facilities shall meet the performance standards specified in this Ordinance.

G. A note informing the owner that the Municipality shall have the right of entry for the purposes of inspecting all stormwater conveyance, treatment, or storage facilities.

H. A location map, drawn to a scale of a minimum of one inch equals two thousand feet (1" = 2,000'), relating the Plan to municipal boundaries, at least two (2) intersections of road centerline or other identifiable landmarks.

I. Existing Features

1. In areas of disturbance, contours at intervals of one (1) or two (2) feet. In areas of steep slopes (greater than 15 percent) and areas undisturbed, five-foot contour intervals may be used.

2. The locations of all existing utilities (including on lot disposal systems and wells), sanitary sewers, and water lines and associated easements.

3. Physical features including flood hazard boundaries, wetlands, sinkholes, streams, lakes, ponds and other waterbodies, existing drainage courses, karst features, areas of native vegetation including trees greater than 6" diameter at breast height, woodlands, other environmentally sensitive areas and the total extent of the upstream area draining through the Development Site

4. An overlay showing soil names and boundaries

5. All existing man-made features within two hundred (200) feet of the Development Site boundary.

J. Proposed Features

1. Changes to the land surface and vegetative cover, including final proposed contours at intervals of one (1) or two (2) feet in areas of disturbance. In areas of steep slopes (greater than 15 percent) and areas undisturbed, five-foot contour intervals may be used.

2. Proposed structures, roads, paved areas, buildings and other impervious and semi-impervious areas

3. The location of any proposed on-lot disposal systems, replacement drainfield easements, and water supply wells.

4. A note indicating existing and proposed land use(s)

5. Plan and profile drawings of all proposed SWM facilities, including BMPs, drainage structures, pipes, open channels, and swales.

6. Where pervious pavement is to be installed, pavement material and construction specifications shall be included

7. The location of all existing and proposed easements, including drainage easements, access easements and riparian corridor easements.

8. A planting plan shall be provided for all vegetated BMPs in accordance with Section 301.N.

K. The location of all E&S control facilities.

Section 404. Additional Information

A. General description of the Development Site, including a description of existing natural and hydrologic features and any environmentally sensitive areas.

B. General description of the overall SWM concept for the project, including a description of permanent SWM techniques, non-structural BMPs to be employed and construction specifications of the materials to be used for structural SWM facilities. The narrative shall include a description of any treatment trains and how the facilities are meant to function with each other to manage stormwater runoff.

C. The effect of the project (in terms of runoff volumes, water quality and peak flows) on adjacent properties and on any existing municipal stormwater management facilities that may receive runoff from the Development Site.

D. Complete hydrologic, hydraulic, and structural computations for all SWM facilities.

E. Expected project time schedule.

Section 405. Supplemental Information

A. In areas of carbonate geology, a detailed geologic evaluation prepared by a registered Professional Geologist (PG) must be submitted as part of the SWM Site Plan. The report shall include, but not limited to the following:

1. The location of the following karst features;

a. sinkholes

b. closed depressions

c. lineaments in carbonate areas

d. fracture traces

e. caverns

f. intermittent lakes

g. ephemeral disappearing streams

h. bedrock pinnacles (surface or subsurface)

2. A plan for remediation of any identified karst features.

3. Impacts of stormwater management facilities on adjacent karst features, and impacts of karst features on adjacent stormwater management facilities.

B. An E&S Plan, including all approvals, as required by 25 Pa. Code Chapter 102, shall be provided to the municipality prior to unconditional final plan approval.

C. For any activities that require a DEP Joint Permit Application and are regulated under Chapter 105 or Chapter 106, require a Penn DOT Highway Occupancy Permit, or require any other permit under applicable state or federal regulations, the permit(s) shall be part of the SWM Site Plan and must be obtained prior to unconditional final plan approval.

D. An Operation and Maintenance (O&M) Plan that addresses the requirements of Section 603.

ARTICLE V
PLAN PROCESSING PROCEDURES

[This information may be revised based on current municipality plan processing procedures]

Section 501. Small Projects.

A. Anyone proposing a Small Project, shall submit # copies of the Small Project Application to the Municipality.

B. A complete Small Project Application shall include:

1. Small Project Application Form (Appendix A)

2. Small Project Sketch Plan including the following:

a. Name and address of landowner (and/or) developer

b. Date of Small Project Application submission.

c. Name of individual and/or firm that prepared the sketch if different than the landowner and/or developer

d. Location and square footage of proposed impervious area or land disturbance

e. Approximate footprint and location of all structures on adjacent properties if located within 50 feet of the proposed impervious area or land disturbance

f. Approximate location of existing stormwater management facilities if present

g. Location and description of proposed stormwater management facilities

h. Direction of proposed stormwater discharge (e.g. with arrows)

i. Scale and north arrow

3. Filing fee (in accordance with the Municipality's current fee schedule).

C. The Small Project Application shall be submitted in a format that is clear, concise, legible, neat and well organized

Section 502. Exemption from Plan Submission Requirements

A. The following regulated activities are specifically exempt from the SWM Site Plan preparation and submission requirements articulated in Section 301.A and Articles IV and V of this Ordinance:

1. Agricultural activity (see definitions) provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

2. Forest management and timber operations (see definitions) provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

3. Conservation Practices being installed as part of the implementation of a Conservation Plan written by an NRCS certified planner.

4. The installation of 1,000 or fewer square feet of Impervious Surface coverage proposed after *(municipality selects the effective date of the Ordinance or an earlier date)*; provided that the activities meet the criteria of Section 502.C below and are conducted in accordance with all requirements of this Ordinance.

5. Domestic landscape and/or vegetable gardening.

B. The municipality may deny or revoke any exemption pursuant to this Section at any time for any project that the municipality believes may pose a threat to public health, safety, property

or the environment.

(The Municipality should Choose between Option A or B with regard to exemptions)

(Option A)

C. An Applicant proposing the cumulative installation of 1,000 square feet or less of Impervious Surface coverage may be exempt from the design, plan submittal, and processing requirements of Articles III, IV, and V of this Ordinance if the proposal meets the criteria in the Section 502.C. No person or activity is exempted from compliance with Section 605 and Articles VII, VIII, and IX of this Ordinance. Exemptions do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation, or ordinance. Exemptions shall not relieve an applicant from implementing such measures as necessary to meet compliance with any NPDES Permit requirements. Any exemption based on false, misleading, or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful.

1. Any Applicant desiring exemption from design, plan submission, and plan processing requirements shall complete an application for exemption in the form set forth in Appendix D and pay any applicable filing fee. *(Use Appendix D Option A)*

2. The Applicant for exemption under this Section 502.C shall provide the municipality with all information necessary for the municipality to determine that:

    a. There shall be no disturbance of land within Floodplains, Wetlands, Environmentally Sensitive Areas, Riparian Forest Buffers, or slopes greater than 15%.

    b. No Impervious Surface coverage shall be installed and no Earth Disturbance Activity shall be conducted within any existing drainage or Stormwater easement created by or shown on any recorded plan.

    c. The Applicant shall minimize soil disturbance, take steps to minimize Erosion and Sedimentation during construction activity, and promptly reclaim all disturbed areas with topsoil and vegetation.

    d. The Applicant shall take steps to insure that Runoff is directed to Pervious Areas on the subject property. No Runoff shall be directed onto an abutting street or neighboring property.

    e. The proposed Impervious Surface shall not adversely impact any existing known problem areas or downstream property owners or the quality of Runoff entering any municipal separate Storm Sewer system.

    f. The applicant shall comply with the erosion and sediment control requirements of

25 Pa Code, Chapter 102 and the proposed Impervious Surface shall not create accelerated Erosion and Sedimentation.

3. If the proposed activity does not meet all of the criteria set forth in Section 502.C.2 above, the Applicant shall follow the Small Project processing procedure in Section 501.

4. The applicant shall comply with applicable State Water Quality Standards. If the proposed activity is located in a High Quality (HQ) or Exceptional Value (EV) watershed, the applicant shall be responsible for compliance with all federal and state requirements applicable to these special protection waters. This exemption does not provide relief from any other applicable state or federal requirements.

5. No Applicant and no activity shall violate or cause to be violated: the Federal Clean Water Act, Clean Streams Law, or any regulation issued thereunder, an NPDES permit, any recorded Stormwater Management or Operations and Maintenance Agreement, or any requirement applicable to a Municipal Separate Storm Sewer System.

(Option B)

C. An Applicant proposing the cumulative installation of 1,000 square feet or less of Impervious Surface coverage may be exempt from the design, plan submittal, and processing requirements of Articles III, IV, and V of this Ordinance. No person or activity is exempted from compliance with Section 605 and Articles VII, VIII, and IX of this Ordinance. The applicant shall comply with the erosion and sediment control requirements of 25 Pa Code, Chapter 102. Exemptions do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation, or ordinance. Exemption shall not relieve an applicant from implementing such measures as necessary to meet compliance with any NPDES Permit requirements. Any exemption based on false, misleading, or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful.

1. Any Applicant desiring exemption from design, plan submission, and plan processing requirements shall complete an application for exemption in the form set forth in Appendix D and pay any applicable filing fee. *(Use Appendix D Option B)*

Section 503. Pre-Application Meeting

D. Applicants are encouraged to schedule a pre-application meeting to review the overall stormwater management concept with Municipal staff/engineer. The pre-application meeting is not mandatory and shall not constitute formal filing of a plan with the Municipality. Topics discussed may include the following;

- Available geological maps, plans and other available data.

- Findings of the site analysis including identification of any environmentally sensitive areas, wellhead protection areas, riparian corridors, hydrologic soil groups, existing natural drainageways, karst features, areas conducive to infiltration to be utilized for volume control, etc.

- Results of infiltration tests.

- Applicable municipal Subdivision and Land Development and/or Zoning ordinance provisions.

- The conceptual project layout, including proposed structural and non-structural BMPs.

Section 504. Stormwater Management Site Plan Submission

A. When a Stormwater Management Site Plan is required, the applicant shall submit the following to the Municipality:

   1. _____ copies to the SWM Site Plan prepared in accordance with the requirements of Article IV of this Ordinance.

   2. Two (2) copies of all supplemental data.

   3. A filing fee (in accordance with the Municipality's current fee schedule).

B. The SWM Site Plan shall be submitted in a format that is clear, concise, legible, neat and well organized.

C. The applicant is responsible for submitting plans to any other agencies such as the Lancaster County Conservation District, PennDOT, DEP, etc. when permits from these agencies are required. Final approval shall be conditioned upon the applicant obtaining all necessary permits.

D. Incomplete submissions as determined by the governing body or its designee, shall be returned to the Applicant within 7 days, along with a statement that the submission is incomplete, and stating the deficiencies found. Otherwise, the application shall be deemed accepted for filing as of the date of submission. Acceptance of the application shall not, however, constitute an approval of the plan or a waiver of any deficiencies or irregularities. The applicant may appeal the Municipality's decision not to accept a particular application in accordance with Section 805 of this Ordinance.

E. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, (name of municipality) may either disapprove the submission and require a resubmission, or in the case of minor deficiencies, (name of municipality) may accept submission of revisions.

Section 505. Municipal Review

A. When the regulated activity constitutes a Subdivision or Land Development as defined in [municipal SALDO], the SWM Site Plan and Subdivision/Land Development Plan shall be processed concurrently according to the plan processing procedure outlined in [cite ordinance section].

B. When the regulated activity constitutes a Small Project the Municipality shall review and take action on the Small Project Application within X days of filing.

C. When the regulated activity does not constitute a Subdivision or Land Development or Small Project the Municipal Engineer shall review the SWM Site Plan for conformance with the provisions of this ordinance.

D. Following receipt of the Municipal Engineer's report and within ninety (90) days following the date of the first regular meeting of the Governing Body after the date the application is filed, the Governing Body will schedule the SWM Site Plan application for action at a regularly scheduled Public Meeting.

E. Within fifteen (15) days of the meeting at which the SWM Site Plan application is acted upon by the Governing Body, written notice of the Governing Body's action shall be sent to the following individuals:

    1. Landowner or his agent.

    2. Applicant.

    3. Firm that prepared the Plan.

    4. Lancaster County Planning Commission.

    5. Lancaster County Conservation District.

F. If the Municipality disapproves the SWM Site Plan, the municipality will state the reasons for the disapproval in writing. The Municipality also may approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing. Such conditional approval shall be contingent upon the applicant's written acceptance of the conditions

Section 506. Revision of Plans

A. Revisions to a SWM Site Plan after submission but before municipal action shall require a re-submission of the modified SWM Site Plan consistent with Section 504 of this Ordinance and be subject to review as specified in Section 505 of this Ordinance.

B. For the purposes of review deadlines, each resubmission required under Section 506.A (after

submission but before approval) shall constitute a new submission for the purposes of time limits as set forth in the MPC and this ordinance.

C. Any substantial revisions to a SWM Site Plan after approval shall be submitted as a new plan to the Municipality, accompanied by the applicable Review Fee.

Section 507. Authorization to Construct and Term of Validity

Approval of a SWM Site Plan shall be valid for a period not to exceed [2-5] years. This time period shall commence on the date that the Municipality approves the SWM Site Plan. If a Certificate of Completion as required by Section 508 of this Ordinance has not been submitted within the specified time period, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits issued by the municipality. SWM Site Plans that are considered disapproved by the Municipality may be resubmitted in accordance with Section 504 of this Ordinance.

Section 508. Certificate of Completion

A. At the completion of the project, and as prerequisite for the release of the Financial Security, the applicant shall provide Certification of Completion from an Engineer, Landscape Architect, Surveyor or other qualified person verifying that all permanent SWM facilities have been constructed according to the Plans and specifications and approved revisions thereto.

B. Upon receipt of the Certificate of Completion, and prior to release of the remaining Financial Security the municipality shall conduct a final inspection to certify compliance with this Ordinance.

Section 509. Plan Recordation

A. Upon completion of the plan improvements the applicant shall submit an As-Built Plan for recordation in the Office of the Recorder of Deeds. The As-Built Plan must show the final design specifications for all stormwater management facilities and be sealed by a registered professional engineer. When a digital submission of an As-Built Plan is required, all coordinates as depicted on the plan shall be based on the PA South Zone State Plane Coordinate System (NAD83 for horizontal and NAVD88 for vertical).

B. Concurrently with the recordation of the As-Built Plan, the applicant shall submit the SWM Site Plan for recordation in the Office of the Recorder of Deeds, unless the Site Plan has already been recorded.

ARTICLE VI
OPERATION AND MAINTENANCE (O&M)

Section 601. Responsibilities of Developers and Landowners

A. The Landowner, successor and assigns shall maintain all Stormwater Management Facilities in good working order in accordance with the approved O & M Plan.

B. The Landowner shall convey to the Municipality easements to assure access for inspections and maintenance, if required.

C. The Landowner shall keep on file with the Municipality the name, address and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information will be submitted to the Municipality within ten (10) days of the change.

D. Enumerate permanent SWM facilities as permanent real estate appurtenances and record as deed restrictions or easements that run with the land.

E. The record owner of the Development Site shall sign and record an Operation and Maintenance (O&M) Agreement covering all Stormwater Management Facilities, including riparian buffers and riparian forest buffers, which are to be privately owned. Said agreement, designated as Appendix C, is attached and made part hereto. The O&M Plan and Agreement shall be recorded as a restrictive covenant agreement that runs with the land.

Section 602. Operation and Maintenance Agreements

A. The Operation and Maintenance Agreement shall be subject to the review and approval of the municipal solicitor and governing body.

B. The Municipality is exempt from the requirement to sign and record an O&M agreement.

Section 603. Operation and Maintenance (O&M) Plan Contents

A. The O&M Plan shall clearly establish the operation and maintenance necessary to ensure the proper functioning of all temporary and permanent stormwater management facilities and erosion and sedimentation control facilities.

B. The following shall be addressed in the O&M Plan:

1. Description of maintenance requirements, including, but not limited to, the following:

a. Regular inspection of the SWM facilities. To assure proper implementation of BMPs, maintenance and care SWM BMPs should be inspected by a qualified person, which may include the landowner, or the owner's designee (including the municipality for dedicated and owned facilities), according to the following minimum frequencies:

i. Annually for the first 5 years.

ii. Once every 3 years thereafter.

iii. During or immediately after the cessation of a 10-year or greater storm.

iv. As specified in the O&M Agreement pursuant to Section 602.

b. All pipes, swales and detention facilities shall be kept free of any debris or other obstruction and in original design condition.

c. Removal of silt from all permanent structures which trap silt or sediment in order to keep the material from building up in grass waterways, pipes, detention or retention basins, infiltration structures, or BMPs, and thus reducing their capacity to convey or store water.

d. Re-establishment of vegetation of scoured areas or areas where vegetation has not been successfully established. Selection of seed mixtures shall be subject to approval by the Municipality.

2. Riparian forest buffer management plan prepared in accordance with 25 Pa. Code Chapter 102 §14(b)(4) if required.

3. Identification of a responsible individual, corporation, association or other entity for ownership and maintenance of both temporary and permanent stormwater management and erosion and sedimentation control facilities.

4. Establishment of suitable easements for access to all facilities.

Section 604. Maintenance of Facilities Accepted by the Municipality

A. The municipality reserves the right to accept or reject any proposal to dedicate ownership and operating responsibility of any SWM facilities to the municipality.

B. If SWM facilities are accepted by the Municipality for dedication, the landowner/developer shall be required to pay a specified amount to the Municipal Stormwater Maintenance Fund to defray costs of periodic inspections and maintenance expenses. This fee shall be provided to the Municipality prior to unconditional plan approval. The amount of the deposit shall be determined as follows subject to the approval of the municipal governing body:

1. The deposit shall cover the estimated costs for maintenance and inspections for twenty-five (25) years. The Municipality will establish the estimated costs according to the O&M requirements outlined in the approved O&M Plan.

2. The amount of the deposit to the fund shall be converted to present worth of the annual series values.

3. If a storage facility is proposed that also serves as a recreation facility (e.g. ballfield, lake), the Municipality may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreation purpose.

C. If at any time a dedicated storage facility is eliminated due to the installation of storm sewers or other storage facility such as a regional detention facility, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after the costs of abandonment are paid will be returned to the depositor.

D. All dedicated facilities shall be inspected by the Municipality according to the following minimum frequencies:

1. Annually for the first 5 years.

2. Once every 3 years thereafter.

3. During or immediately after the cessation of a 10-year or greater storm.

4. As specified in the O&M Agreement pursuant to Section 602.

E. Maintenance shall be conducted as necessary to provide for the continued functioning of the facility. Costs of inspections, maintenance and repairs are recoverable from the Municipal Stormwater Maintenance Fund.

Section 605. Maintenance of Existing Facilities / BMPs

A. SWM facilities existing on the effective date of this Ordinance, which have not been accepted by the Municipality or for which maintenance responsibility has not been assumed by a private entity such as a homeowners' association shall be maintained by the individual Landowners. Such maintenance shall include at a minimum those items set forth in Section 603.B.1 above. If the Municipality determines at any time that any permanent SWM facility has been eliminated, altered, blocked through the erection of structures or the deposit of materials, or improperly maintained, the condition constitutes a nuisance and the Municipality shall notify the Landowner of corrective measures that are required, and provide for a reasonable period of time, not to exceed 30 days, within which the property owner shall take such corrective action. If the Landowner does not take the required corrective action, the Municipality may either perform the work or contract for the performance of the work and bill the Landowner for the cost of the work plus a penalty of 10% of the cost of the work. If such bill is not paid by the property owner within 30 days, the Municipality may file a municipal claim against the property upon which the work was performed in accordance with the applicable laws. The municipality shall have the right to choose among the remedies and may use one or more remedies concurrently.

ARTICLE VII
FEES AND EXPENSES

Section 701. General

The municipality may include all costs incurred in the review fee charged to an applicant.

Section 702. Expenses Covered by Fees

The review fee may include, but not be limited to, costs for the following:

A. Administrative and clerical costs.

B. Review of the SWM Site Plan.

C. Review of the Stormwater Operation and Maintenance Plan and Stormwater Agreement by the Municipal Solicitor/Staff.

D. Inspections.

E. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

ARTICLE VIII
PROHIBITIONS

Section 801. Prohibited Discharges and Connections

A. The following connections are prohibited, except as provided in Section 801.D below.

1. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a municipal separate storm sewer (if applicable), or waters of this Commonwealth, and any connections to the storm sewer from indoor drains and sinks; and

2. Any drain or conveyance connected from a commercial or industrial land use to the municipal separate storm sewer (if applicable) which has not been documented in plans, maps, or equivalent records, and approved by the Municipality.

B. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (1) as provided in Section 801.D below and (2) discharges allowed under a state or federal permit.

C. No person shall place any structure, fill, landscaping or vegetation into a SWM facility or within a drainage easement that will limit or diminish the functioning of the facility in any manner.

D. The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth:

- Discharges from firefighting activities
- Potable water sources including water line flushing
- Irrigation drainage
- Air conditioning condensate
- Springs
- Water from crawl space pumps
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used
- Flows from riparian habitats and wetlands
- Uncontaminated water from foundations or from footing drains
- Lawn watering
- De-chlorinated swimming pool discharges
- Uncontaminated groundwater
- Water from individual residential car washing
- Routine external building wash down (which does not use detergents or other compounds)
- Diverted stream flows
- Rising ground waters

E. In the event that the municipality or DEP determines that any of the discharges identified in Section 801.D above significantly contribute to pollution of the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 802. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures without the written approval of the municipality

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ARTICLE IX
ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry

Upon presentation of proper credentials, duly authorized representatives of the Municipality may enter at reasonable times upon any property within the Municipality to investigate or ascertain the condition of the subject property in regard to any aspect regulated by this Ordinance.

Section 902. Enforcement

The municipal governing body is hereby authorized and directed to enforce all of the provisions of this ordinance.

A. Any permit or approval issued by the municipality pursuant to this ordinance may be suspended by the Municipality for:

1. Noncompliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement.

2. A violation of any provisions of this ordinance or any other applicable law, ordinance, rule, or regulation relating to the regulated activity.

3. The creation of any condition or the commission of any act during construction or development that constitutes or creates a hazard, nuisance, pollution or endangers the life or property of others.

B. A suspended permit may be reinstated by the Municipality when:

1. The Municipality has inspected and approved the corrections to the violation that caused the suspension;

2. The Municipality is satisfied that the violation has been corrected.

Section 903. Penalties

A. Any person who or which has violated any provisions of this Ordinance, shall, upon a judicial determination thereof, be subject to civil judgment for each such violation of not less than _____ and 00/100 dollars ($_____), or more than _____ and 00/100 dollars ($_____), for each violation, recoverable with costs. Each day that a violation occurs shall constitute a separate offense. All fines shall be paid to [Name of Municipality].

B. In addition, the [Name of Municipality] may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance, and may request any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

Section 904. Appeals

A. Any person aggrieved by any administrative action of the [Municipality] may appeal to [the Municipality's governing body] within 30 days of that action. Any such appeal shall be governed by the procedures of Article V of the Local Agency Law, 2 Pa. C.S.A. 401 et seq.

B. Any person aggrieved by any decision of [the Municipality's governing body] may appeal to the Lancaster County Court of Common Pleas, in accordance with Article VII of Local Agency Law, 2 Pa. C.S.A. 701 et seq. the Local Agency Law, within 30 days of that decision.

Section 905. Modification of Ordinance Provisions

A. The provisions of this Ordinance not relating to water quality are intended as minimum standards for the protection of the public health, safety, and welfare. The Municipality reserves the right to modify or to extend them conditionally in individual cases as may be necessary in the public interest; provided, however, that such variation shall not have the effect of nullifying the intent and purpose of this Ordinance, and that the applicant shows that to the satisfaction of the Municipality that the applicable regulation is unreasonable, or will cause undue hardship, or that an alternative proposal will allow for equal or better results. The list of such modifications, along with an explanation of and justification for each modification, shall be included on the plan. This section does not apply during an enforcement action.

B. In granting waivers/modifications for provisions of this Ordinance not relating to water quality, the Municipality may impose such conditions as will, in its judgment, secure substantially the objectives of the standards and requirements of this Ordinance.

ARTICLE X
REFERENCES

1. 25 Pennsylvania Code, Chapter 102 Erosion and Sediment Control

2. Minnesota Pollution Control Agency

3. Code of Federal Regulations – Title 44: Emergency Management and Assistance, §9.4 Definitions

4. *25 Pa.Code Chapter 105*

5. Based on definition in Wisconsin Department of Natural Resources Administrative Rule NR 151.006.

6. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual.* Harrisburg, PA.

7. City of Jacksonville website, http://www3.coj.net/Departments/CityFees/Glossary.aspx

8. Lancaster County Model Subdivision and Land Development Ordinance.

9. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual.* Harrisburg, PA.

10. CSN Technical Bulletin No. 5, Stormwater Design for High Intensity Redevelopment Projects in the Chesapeake Bay Watershed, version 2.0. Chesapeake Stormwater Network, January 5, 2011 – page 43.

11. "Penn State Urban Hydrology Model User Manual" by Thomas A. Seybert, PE, David F. Kibler, PE, and Elizabeth l. White, PE, August 1993 page 70 and VT/PSUHM help screen.

12. 25 Pa. Code, Chapter 71 Administration of Sewage Facilities Planning Program, § 71.1

ENACTED and ORDAINED at a regular meeting of the _____
[Name of the municipal governing body] on the _____th day of _____, 20____.
This Ordinance shall take effect immediately.

_____
[Name], [Title]

_____
[Name], [Title]

_____
[Name], [Title]

ATTEST:

_____
[Name], Secretary (type or print)

I hereby certify that the foregoing Ordinance was advertised in the _____ [name of newspaper] on _____ [date], a newspaper of general circulation in the Municipality and was duly enacted and approved as set forth at a regular meeting of the _____ [name of municipal governing body] held on _____ [date].

_____
[name], Secretary

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APPENDIX A
SAMPLE SMALL PROJECT APPLICATION

File Number_____ Date Received _____

Submitted Fees $_____ Approval of Application Date _____

Project Street Address:_____

Project Name: _____

Owner's Name and Address: _____

Phone# / Fax# / Email: _____

Please list the date of any previous Small Project Applications for the subject property:

_____

Proposed Activity:

[ ] Removal of ground cover, grading, filling or excavation of an area less than 5,000 square feet

Total area of land disturbance: _____ sq. ft.

Type of Regulated Activity (check all that apply):

[ ] Removal of ground cover
[ ] Grading
[ ] Filling
[ ] Excavation
[ ] Other earth disturbance activity (please describe)
_____

[ ] Addition of Impervious Surface (1,000 SF or less)

Type of new impervious surface: [ ] driveway, [ ] shed, [ ] garage, [ ] deck, [ ] walkway,

[ ] other (describe) _____

Total new impervious surface proposed for construction: _____ sq. ft.

Are you removing existing impervious as part of this project?

[ ] No
[ ] Yes – Total area of existing Impervious to be removed _____ sq. ft.

Check all items below that will be impacted by the project:

_____Mature trees
_____Sinkholes
_____Water wells
_____Septic drainfields
_____Alternate septic drainfields
_____Creeks, streams, wetlands, or ponds
_____Existing stormwater management facility (basin, swale, etc.)
_____Easements

Small Project Application Pg. 2

Total runoff volume to be permanently removed/managed on site from attached calculation worksheet:_____ gallons or _____ cubic feet

Proposed Stormwater Management Controls (Best Management Practice):

_____ Rain Garden
_____ Infiltration Trench
_____ Cistern
_____ Rain Barrel
_____ Other (describe) _____

Sketch

Provide a sketch of the proposed additional impervious area or land disturbance. Include the following on the sketch:

- Property boundary
- Location and approximate footprint of existing structures (buildings, patios, driveways, etc.)
- Approximate location of any of the following features which will be impacted by the project:
  - Mature trees
  - Sinkholes
  - Water wells
  - Septic drainfields
  - Alternate septic drainfields
  - Creeks, streams, wetlands, ponds
  - Existing stormwater management facilities (basins, swales, etc.)
- Location and approximate footprint of proposed impervious area or land disturbance.
- Approximate footprint and location of all structures on adjacent properties if located within fifty feet (50') of the proposed impervious area or land disturbance
- Location and description of proposed stormwater management facilities (e.g. rain gardens, swales, rain barrels, etc.)
- Direction of proposed stormwater discharge (e.g. with arrows)
- Scale and north arrow

Person/Firm to be completing work: _____
Phone# / Fax# / Email: _____

Name of Person Submitting this Application: _____
Signature: _____
Date: _____

Small Project Application Calculation Worksheet

The applicant may use the following to calculate the amount of runoff which must be managed in accordance with Section 302.B of this Ordinance.

Project Name: _____

Owner Name: _____

Proposed Additional Impervious Area: _____ square feet

Impervious Area Calculations

Calculate the amount of runoff to be permanently removed (managed on site through reuse, evaporation, transpiration or infiltration):

Additional impervious area ÷ 12 = Permanently Removed Runoff Volume (PRV)

_____ square feet of additional impervious ÷ 12 = _____cubic feet PRV
_____ cubic feet x 7.48 gallons per cubic feet = _____ gallons PRV

EXAMPLE

Small Project Application Calculation Worksheet

Landowner Name: Jane Doe (20 x 45' garage)

Owner Name: Jane Doe

Proposed Additional Impervious Area: 900 square feet

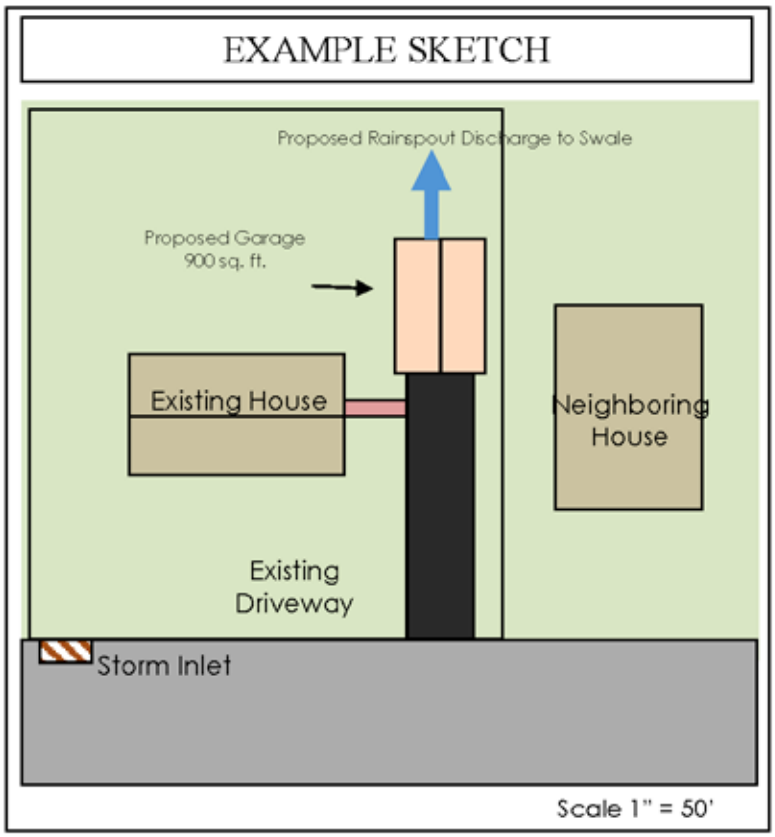
Impervious Area Calculations

Calculate the amount of runoff to be permanently removed (managed on site through reuse, evaporation, transpiration or infiltration) using the following formula:

Additional impervious area ÷ 12 = Permanently Removed Runoff Volume (PRV)

900 square feet of additional impervious ÷ 12 = 75 cubic feet PRV

75 cubic feet x 7.48 gallons per cubic feet = 561 gallons PRV



APPENDIX NO. B-1

RUNOFF COEFFICIENTS "C" FOR
RATIONAL FORMULA

Note to Municipalities: The ordinance should include a table with Runoff Coefficients "C" for the Rational Equation from the Pa DEP Erosion and Sediment Pollution Control Program Manual, Table 5.2 (March 2012) or other source as recommended by the municipality's engineer.

APPENDIX NO. B-2

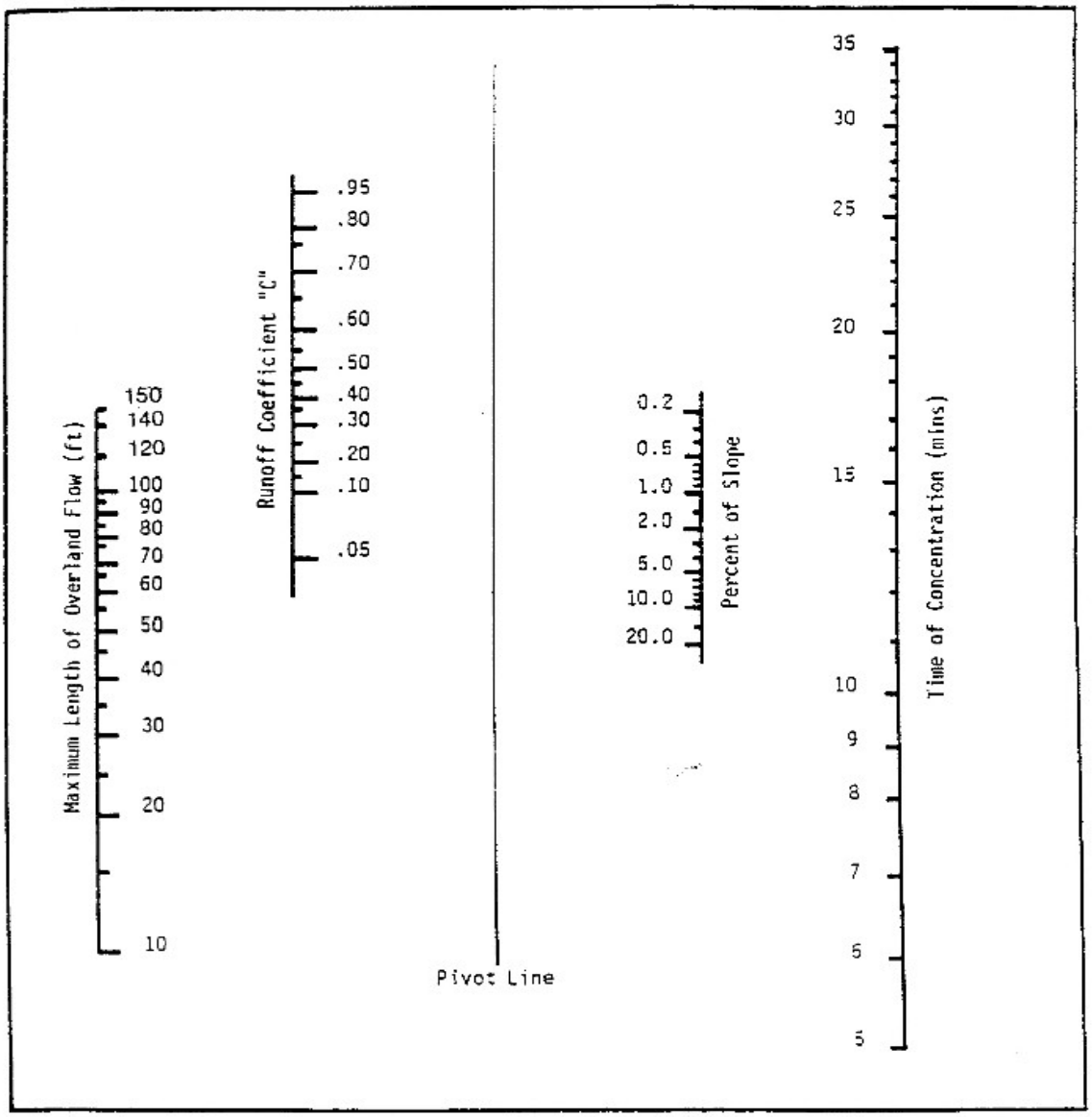
RUNOFF CURVE NUMBERS "CN" FOR SCS METHOD*

Note to Municipalities: The ordinance should include a table with Runoff Curve Numbers "CN" from U. S. Department of Agriculture, Natural Resources Conservation Service, June 1986, *Urban Hydrology for Small Watersheds,* Technical Release No. 55 (TR-55), Second Edition (or a more current version if applicable) or other source as recommended by the municipality's engineer.

APPENDIX NO. B-3

NOMOGRAPH FOR DETERMINING SHEET FLOW

(for use with the Rational Method)



APPENDIX NO. B-4

Worksheet 1: Time of consentration (T_c) or travel time (T_t)

Project	By	Date
Location	Checked	Date

Check one: ☐ Present ☐ Developed _____

Check one: ☐ T_c ☐ T_t through subarea _____

Notes: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID		
1. Surface description (table 3-1)			
2. Manning's roughness coefficient., n (table 3-1)			
3. Flow length, L (total L ≤ **150 ft) ..... ft			
4. Two-year 24-hour rainfall, P_2 ..... in			
5. Land slope, s ..... ft/ft			
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t ..... hr		+	=

Shallow concentrated flow

	Segment ID		
7. Surface description (paved or unpaved)			
8. Flow length, L .....ft			
9. Watercourse slope, s ..... ft/ft			
10. Average velocity, V (figure 3-1) ..... ft/s			
11. $T_t = \frac{L}{3600V}$ Compute T_t ..... hr		+	=

Channel flow

	Segement ID		
12. Cross sectional flow area, a ..... ft^2			
13. Wetted perimeter, p_w ..... ft			
14. Hydraulic radius, r= $\frac{a}{p_w}$ Compute r ..... ft			
15. Channel slope, s ..... ft/ft			
16. Manning's roughness coefficient, n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V .....ft/s			
18. Flow length, L ..... ft			
19. $T_t = \frac{P}{3600\ V}$ Compute T_t ..... hr		+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... Hr			

* Table 3-1 per latest TR-55, Urban Hydrology for Small Watershed

** 150' sheet flow length per latest TR-55 revision

(210-VI-TR-55, Second Ed., June 1986) D–3

APPENDIX NO. B-5

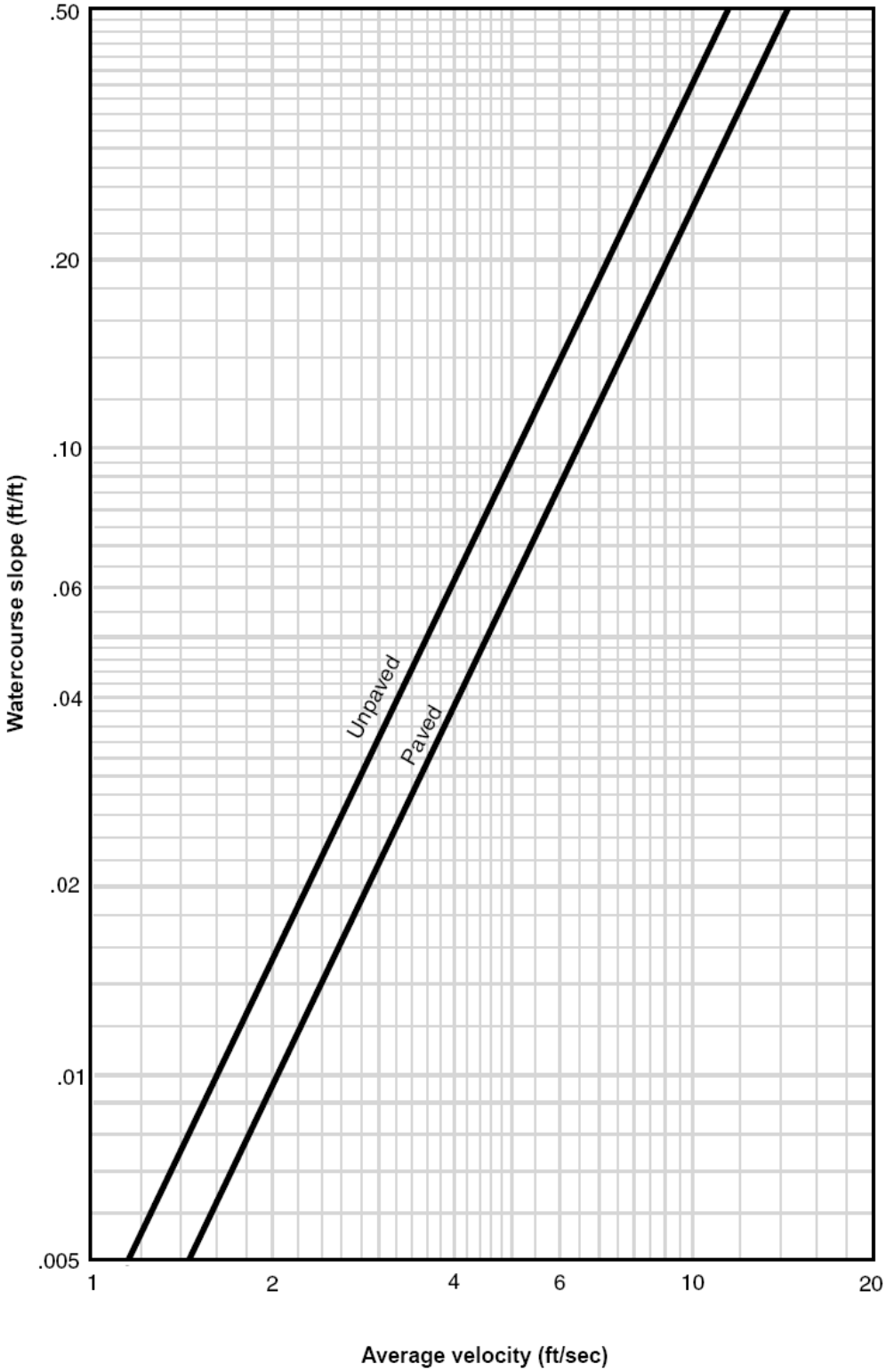


FIGURE 203-2: Average Velocities for Estimating Travel Time for Shallow Concentrated Flow
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)

APPENDIX C

OPERATION AND MAINTENANCE (O&M) AGREEMENT
STORMWATER MANAGEMENT FACILITIES

THIS AGREEMENT, made and entered into this _____ day of _____, 20___, by and between _____, (hereinafter the "Landowner"), and _____ , _____ County, Pennsylvania, (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____County, Pennsylvania, Deed Book _____ at page _____, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM FACILITIES Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of Stormwater Management Best Management Practices (BMPs); and

WHEREAS, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM Facilities be constructed and maintained on the Property; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM Facilities as required by said SWM Site Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the SWM Facilities in accordance with the plans and specifications identified in the SWM Site Plan.

2. The Landowner shall operate and maintain the SWM Facilities as shown on the SWM Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.

3. The Landowner hereby grants permission to the Municipality, its authorized agents and employ-

ees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the SWM Facilities whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the SWM Facilities per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said SWM Facilities. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred, plus a 10% penalty, within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite SWM Facilities by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality.

8. The Municipality intends to inspect the SWM Facilities at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of _____County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL) For the Municipality:

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of _____, 20_____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20_____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS_____ day of _____, 20_____.

_____ _____

NOTARY PUBLIC **(SEAL)**

BIBLIOGRAPHY

Agricultural Preserve Board. *Agricultural Conservation Easement Program Guidelines.* January 2010. <http://www.co.lancaster.pa.us/lanco/lib/lanco/APB_Program_Guidelines_January_2010.pdf>

Alliance for the Chesapeake Bay, and Center for Watershed Protection. *Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships, and Lancaster County, Pennsylvania.* November 2004. <http://www.acb-online.org/pubs/projects/deliverables-78-2-2006.pdf>

Center for Watershed Protection, Inc. Memo to Mary Gattis, Lancaster County Planning Commission, Lancaster, PA. 17 May, 2011. "Findings and Recommendations from the Lancaster County Stormwater Retrofit Assessment."

Commonwealth of Pennsylvania, Department of Transportation. *Publication 13M (DM-2), SOL 432-07-07 Attachment "A,"* by B.G. Thompson. December 2007. <ftp://ftp.dot.state.pa.us/public/bureaus/design/H&H/4320707.pdf>

County of Lancaster. "Cocalico Creek Watershed Act 167 Plan." June 2002. <http://www.co.lancaster.pa.us/lanco/cwp/view.asp?a=11&Q=468940>

County of Lancaster. "Conestoga River Watershed Act 167 Plan." June 2005. <http://www.co.lancaster.pa.us/lanco/cwp/view.asp?a=11&Q=468961>

County of Lancaster. "Little Conestoga Creek Watershed Act 167 Plan." December 1997. <http://www.co.lancaster.pa.us/lanco/cwp/view.asp?a=11&Q=468954>

County of Lancaster. "Mill Creek Watershed Act 167 Plan." December 1996. <http://www.co.lancaster.pa.us/lanco/cwp/view.asp?a=11&Q=468947>

Day, S.D., and S.B. Dickinson, eds. *Managing Stormwater for Urban Sustainability using Trees and Structural Soils.* 2008. <http://www.tigard-or.gov/community/trees/docs/managing_stormwater_using_trees.pdf>

Edwards, R.E., and R.D. Pody. *Northern Lancaster County Groundwater Study: A Resources Evaluation of the Manheim-Lititz and Ephrata Area Groundwater Basins.* 21 September 2005. <http://www.srbc.net/pubinfo/techdocs/Publication_235/Publication_235.pdf>

Federal Emergency Management Agency. *Flood Insurance Study, Lancaster County, Pennsylvania, All Jurisdictions.* 19 April 2005.

Governor's Sustainable Infrastructure Task Force. *Creating a Sustainable Solution for Pennsylvania, Governor's Sustainable Infrastructure Task Force Report.* 1 November 2008. <http://www.portal.state.pa.us/portal/server.pt/community/sustainable_water_infrastructu re_task_force/10565>

Hourglass Foundation. *Cleaning Up the Chesapeake Bay, The Challenge for Lancaster County.* June 2011. <http://hourglassfoundation.org.tempwebpage.com/pdf/white_paper_-_cleaning_up_the_chesapeake_bay.pdf>

Herbert, Rowland & Grubic, Inc. *Water/Sewer Infrastructure Capacity Study.* December 2012.

Lancaster City, Lancaster County, Pennsylvania. *Green Infrastructure Plan.* April 2011. <http://www.cityoflancasterpa.com/lancastercity/lib/lancastercity/cityoflancaster_giplan_fullreport_april2011_final.pdf>

Lancaster City, Lancaster County, Pennsylvania. *Urban Park, Recreation and Open Space Plan for the City of Lancaster, Pennsylvania.* 31 July 2009. <http://www.cityoflancasterpa.com/lancastercity/lib/lancastercity/upr-doc_2009-10-19.pdf>

Lancaster County Conservation District. *Watershed Implementation Plan, Mill Creek.* 28 June 2006. <http://www.lancasterwatersheds.org/Mill%20Creek%20Watershed%20Implementation%20Plan.pdf>

Lancaster County Engineers Office. *Act 167 Storm Water Management Plan for Lancaster County, Technical Report.* June 2006. Revised, July 2007. <http://files.dep.state.pa.us/water/Watershed%20Management/WatershedPortalFiles/StormwaterManagement/Approved%20Plans/Act%20167%202006%20Lancaster%20Countywide.pdf>

Lancaster County Planning Commission. *Balance, the Growth Management Element of the Lancaster County Comprehensive Plan.* April 2006.

Lancaster County Planning Commission. Comprehensive Sewerage Plan. 30 October 1970.

Lancaster County Planning Commission. Final Report on the Lancaster County, Pennsylvania Sewer and Water Resources Study. May 1987.

Lancaster County Planning Commission. *Greenscapes, the Green Infrastructure Element of the Lancaster County Comprehensive Plan.* February 2009.

Lancaster County Planning Commission. *Lancaster County Model Stormwater Management Ordinance.* October 2012.

Lancaster County Planning Commission. *Lancaster County Water Resources Plan, Water Supply Plan and Wellhead Protection Program.* Fall 1996.

Lancaster County Planning Commission. *Model Conservation Zoning District and Natural Resource Protection Standards.* June 2010. <http://www.co.lancaster.pa.us/toolbox/lib/toolbox/tools/modelconservzoningdistnatresourcestds.pdf>

Lancaster County Planning Commission. Report on Water Resources Study of Lancaster County, Pennsylvania. August 1966.

Lancaster County Planning Commission. "Smart Growth Toolbox." <http://www.co.lancaster.pa.us/toolbox/site/default.asp>

Lancaster County Planning Commission. "Toolbox: Featured Tool #6 - Rural Areas Designation Process." <http://www.co.lancaster.pa.us/toolbox/cwp/view.asp?a=3&Q=634532&PM=1>

Lancaster County Planning Commission. "Toolbox: Rural Wastewater Strategies." <http://www.co.lancaster.pa.us/toolbox/cwp/view.asp?a=3&Q=633937&PM=1>

Lancaster County Transportation Coordinating Committee. *Lancaster County Transportation Coordinating Committee Memorandum of Understanding (MOU), Procedures for 2013-2016 Transportation Improvement Program (TIP) Modifications.* n.d. <http://www.co.lancaster.pa.us/planning/lib/planning/transportation/2013_tip_adopted/tip_mod_procedures_2013.pdf>

LandStudies, Inc. *Chiques Creek Watershed Assessment, Channel Stability Assessment and Stream Restoration Prioritization.* July 2002. <http://www.lancasterwatersheds.org/Chiques%20Cr.%20Watershed%20Assessment.pdf>

LandStudies, Inc. *Cocalico Creek Watershed Restoration Plan, Lancaster County, Pennsylvania.* December 2008. <http://www.lancasterwatersheds.org/Cocalico%20Creek%20Watershed%20Restoration%20Report.pdf>

LandStudies, Inc. *Floodplain Restoration.* 2010. <http://landstudies.com/images/pdfs/LS-FloodplainRestoration.12sm.pdf>

LandStudies, Inc. *Lititz Run Watershed, "A Community Improving Its Water Quality."* March 1999. <http://lancasterwatersheds.org/Lititz%20Run%20Watershed%20Assessment%20Plan.pdf>

LandStudies, Inc. *Octoraro Creek Scenic River Study.* February 1999. <http://www.lancasterwatersheds.org/watershedplans.php>

Land Ethics, Inc. and Derck & Edson Associates, LLP. *Conestoga Greenways: A River Corridor Conservation Plan.* 1999.

Meritts, D., and R. Walter. "Colonial Mill Ponds of Lancaster County Pennsylvania as a Major Source of Sediment Pollution to the Susquehanna River and Chesapeake Bay." *Southeast Friends of the Pleistocene Field Trip Guidebook.* Fall 2003. <http://facewebsites.com/spoommidatlantic/site_files/editor_files/image/file/Milling%20History/ColonialMillSediment.pdf>

Metzler, M.A. *Fixing a Broken Trout Stream, Donegal Creek Restoration Project.* n.d. <http://

lancasterwatersheds.org/Donegal%20Creek%20Planning%20Booklet.pdf>

Pennsylvania Department of Environmental Protection. *Draft 2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report, Clean Water Act Section 305(b) Report and 303(d) List.* 2012. <http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/2012%20Integrated%20List/2012%20Pennsylvania%20Integrated%20Water%20Quality%20Monitoring%20and%20Assessment%20Report.pdf>

Pennsylvania Department of Environmental Protection. *Pennsylvania Chesapeake Watershed Implementation Plan.* 11 January 2011. <http://files.dep.state.pa.us/water/Chesapeake%20Bay%20Program/ChesapeakePortalFiles/REVISED%20FINAL%20PA%20Chesapeake%20Bay%20WIP%201-11-11.pdf>

Pennsylvania Department of Environmental Protection. *State Water Plan Principles.* March 2009. <http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-76835/3010-BK-DEP4222.pdf>

Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management. *Source Water Assessment and Protection Program.* 24 March, 2000. <http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-47521/383-5000-001.pdf>

Pennsylvania Department of Environmental Protection, Bureau of Waterways Engineering and Wetlands. *Erosion and Sediment Pollution Controls Program Manual.* March 2012. <http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-87860/363-2134-008.pdf >

Pennsylvania Department of Environmental Protection, Central Office, Office of Water Management. *Total Maximum Daily Load (TMDL) Lititz Run, Lancaster County.* August 2004. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Lititz_TMDL.pdf>

Pennsylvania Department of Environmental Protection, Central Office, Office of Water Management. *Total Maximum Daily Load (TMDL) Unnamed Tributary to Mill Creek, Lancaster County.* August 2004. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/UntMillCreek_TMDL.pdf>

Pennsylvania Department of Environmental Protection, Office of Water Management, Bureau of Watershed Conservation. T*otal Maximum Daily Load (TMDL) For Nutrients and Sediments in the Donegal Creek, Lancaster County.* 11 April 2000. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Donegal_TMDL.pdf>

Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy. *Natural Heritage Inventory of Lancaster County, Pennsylvania,* Update 2008. 2008. <http://www.naturalheritage.state.pa.us/CNAI_PDFs/Lancaster%20County%20NAI%202008%20Update%20WEB.pdf>

Pennsylvania State University, Environmental Resources Research Institute. *Total Maximum Daily Loads (TMDLs) Development Plan for Chickies Creek Watershed.* 2 March 2001. <http://www.dep.

state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Chickies_TMDL.pdf>

Pennsylvania State University, Environmental Resources Research Institute. *Total Maximum Daily Loads (TMDLs) Plan for Conewago Creek Watershed.* 27 June 2006. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Conewago_TMDL.pdf >

RETTEW Associates, Inc. *Coldwater Conservation Plan, Furnace Run and Segloch Run.* 2004. <http://lancasterwatersheds.org/Furnace%20Run%20&%20Segloch%20Run%20Coldwater%20Conservation%20Plan.pdf>

RETTEW Associates, Inc. *Conewago Creek Restoration Plan.* May 2006. <http://files.dep.state.pa.us/Water/Watershed%20Management/lib/watershedmgmt/nonpoint_source/implementation/conewago_creek.pdf>

RETTEW Associates, Inc. *Conowingo Creek TMDL Implementation Plan.* September 2006. <http://files.dep.state.pa.us/Water/Watershed%20Management/lib/watershedmgmt/nonpoint_source/implementation/conowingo_creek.pdf>

RETTEW Associates, Inc. *Fishing Creek Watershed Assessment.* May 2006. < http://www.lancasterwatersheds.org/watershedplans.php>

RETTEW Associates, Inc. *Little Conestoga Creek Watershed Assessment and Restoration Plan.* January 2003. <http://www.lancasterwatersheds.org/watershedplans.php>

Susquehanna River Basin Commission. *Comprehensive Plan for the Water Resources of the Susquehanna River Basin.* December 2008. Amended, June 2012. <http://www.srbc.net/planning/assets/documents/Comprehensive%20Plan%20w%20Appendices%20Amended%20June%202012%20FINAL%208_27_12%20FINAL.pdf>

Susquehanna River Basin Commission. *Groundwater Management Plan for the Susquehanna River Basin.* June 2005. <http://www.srbc.net/programs/docs/GW_Mngt_Plan_June2005/GWMP%20Final.pdf>

Susquehanna River Basin Commission. *Susquehanna River Basin Commission Water Resources Program (Fiscal Years 2013-2014).* 7 June 2012. <http://www.srbc.net/planning/2013-2014%20Water%20Resources%20Program%20FINAL%2006-07-12_fs150932.PDF>

Susquehanna River Basin Commission, Water Quality and Monitoring Program. *Total Maximum Daily Loads (TMDLs) Conowingo Creek, Lancaster County.* 2 March 2001. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Conowingo_TMDL.pdf>

Susquehanna River Basin Commission, Water Quality and Monitoring Program. *Total Maximum Daily Loads (TMDLs) Pequea Creek, Lancaster County.* 2 March 2001. Revised, 18 August 2006. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Pequea_TMDL.pdf>

Tetra Tech, Inc. *Total Maximum Daily Load for the Muddy Run Watershed, Pennsylvania.* 28 February 2001. <http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/tmdl/Muddy_TMDL.pdf>

The ARRO Group, and LandStudies, Inc. *Little Chiques Creek Watershed Rivers Conservation Plan.* October 2005. <http://lancasterwatersheds.org/2.Little%20Chiques%20Cr.%20Conservation%20Plan%20-%20Final%20Report.pdf>

United States Department of Agriculture, Natural Resources Conservation Service. "WinTR-55 Watershed Hydrology | NRCS." <http://nitcnrcsbase-www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/quality/?&cid=stelprdb1042901>

United States Department of Agriculture, Soil Conservation Service. *Soil Survey of Lancaster County Pennsylvania.* May 1985. <http://soildatamart.nrcs.usda.gov/manuscripts/PA071/0/Lancaster.pdf>

United States Environmental Protection Agency. *Coming Together for Clean Water: EPA's Strategy to Protect America's Waters.* March 2011. <https://blog.epa.gov/waterforum/wp-content/uploads/2011/04/ComingTogether-for-Clean-Water-FINAL.pdf>

United States Environmental Protection Agency. *Water Quality Scorecard, Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales.* October 2009. <http://www.epa.gov/dced/pdf/2009_1208_wq_scorecard.pdf>

United States Environmental Protection Agency, Nonpoint Source Control Branch (4503T). *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices.* December 2007. <http://water.epa.gov/polwaste/green/upload/2008_01_02_NPS_lid_costs07uments_reducingstormwatercosts-2.pdf>

United States Environmental Protection Agency, and the EPA Region III states of Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia. *Understanding Impaired Waters and Total Maximum Daily Load (TMDL) Requirements for Municipal Stormwater Programs.* January 2008. <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/region3_factsheet_tmdl.pdf>

Other Resources

Lancaster County Planning Commission (LCPC) website

Lancaster County Recorder of Deeds website

Lancaster Farmland Trust website

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Blueprints

An Integrated Water Resources Plan for Lancaster County

Lancaster County Planning Commission
150 North Queen Street • Suite #320 • Lancaster, PA • (717) 299-8333
www.co.lancaster.pa.us/planning
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